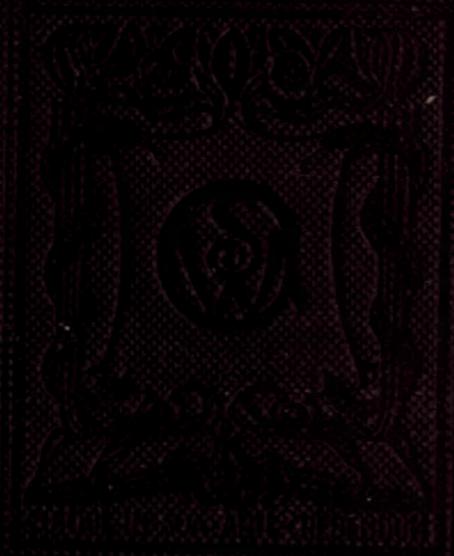




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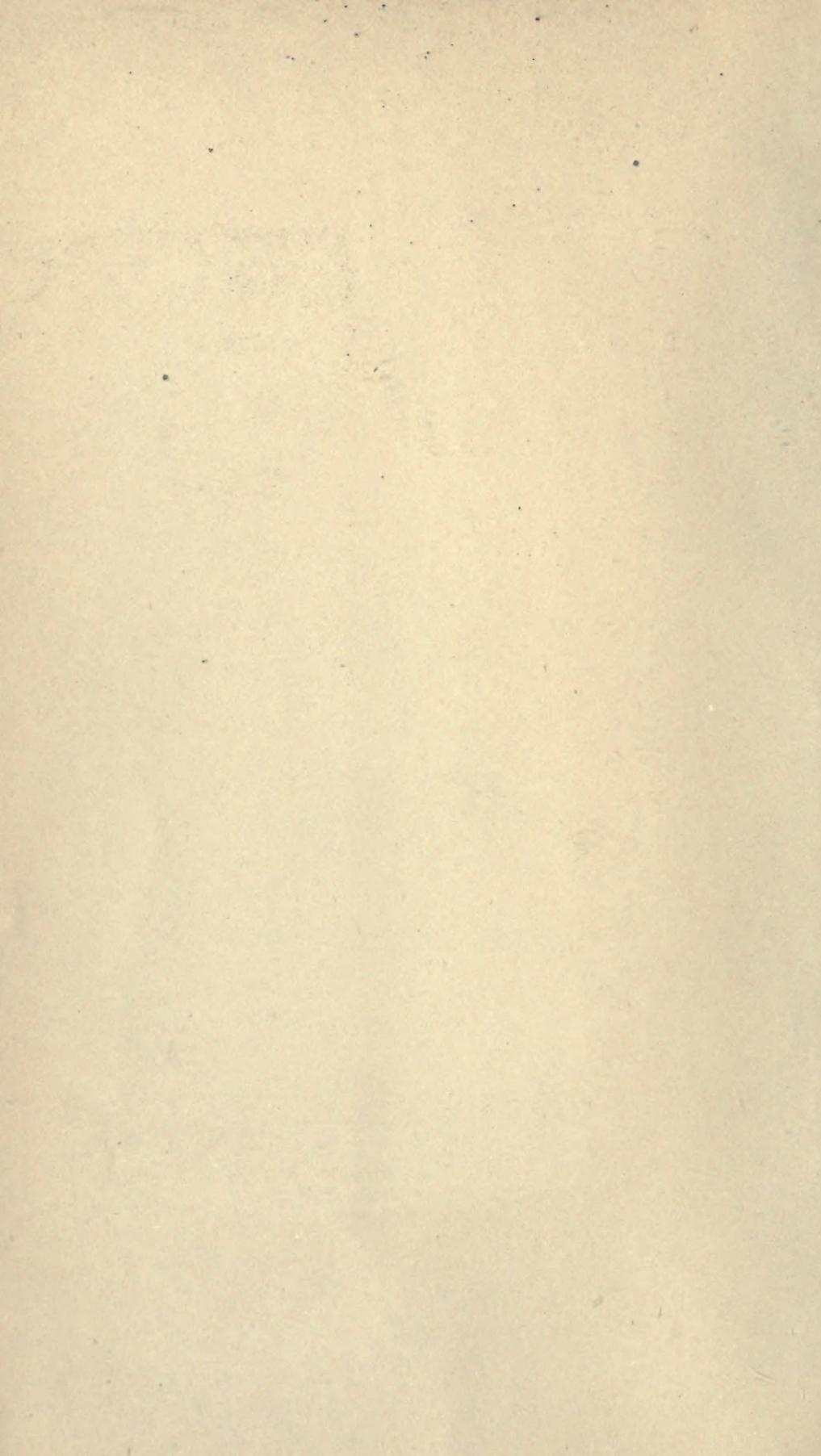
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HAY FEVER
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PAROXYSMAL SNEEZING
(*VASOMOTOR RHINITIS*)



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September 1910

HAY FEVER AND PAROXYSMAL SNEEZING

(*VASOMOTOR RHINITIS*)

BY

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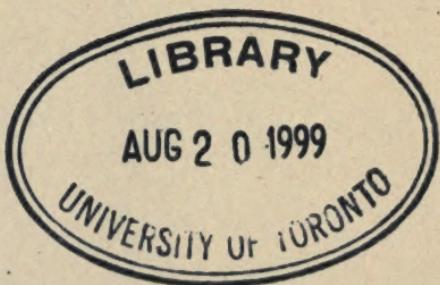
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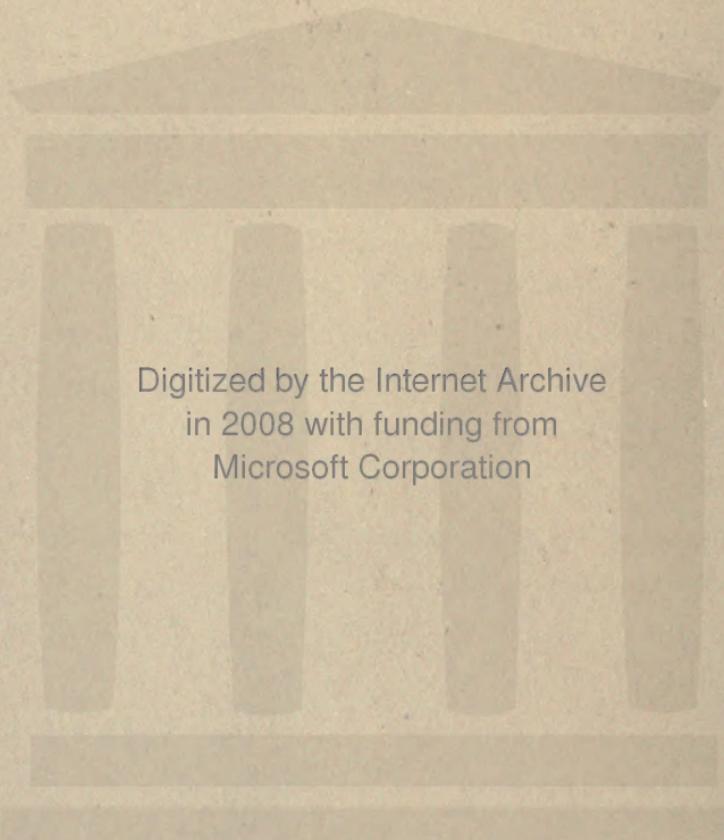


P R E F A C E

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EUGENE S. YONGE.

ST. PETER'S SQUARE,
MANCHESTER, *August* 1910.



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HAY FEVER AND PAROXYSMAL SNEEZING

(*VASOMOTOR RHINITIS*)

I. HAY FEVER (HAY ASTHMA).

HISTORICAL SKETCH

SOMEWHERE about the first quarter of the nineteenth century attention began to be directed to the occurrence of a curious and hitherto unclassified disorder—a malady which attacked the eyes and the nasal organ, and in some instances the chest, and which was observed to assail its victims at a particular season of the year but at no other period. The malady appeared, moreover, to be the peculiar appanage of the better classes, with, if anything, a predilection for those belonging to the upper ten thousand. “It appears,” says a contemporary writer, “to be quite an aristocratical affection . . . a highly gentlemanlike and indeed (I may add) *noble* affection.” This “aristocratical affection” gradually became known by the name of hay fever, and the designation still remains in common use, in spite of the fact that the disorder is neither due to hay nor characterised by the presence of fever. Nevertheless the popular term has not been suffered to remain unchallenged; on the contrary, the nomenclature of the disease has received quite a disproportionate amount of attention, and a prodigious number of synonyms, in English, French, German, and other languages, has been suggested. Some of the designations are based on the season of incidence (*e.g.* Summer Catarrh, June Cold, **Frühsommer-Katarrh**, etc.); others relate to the assigned

cause of the malady (Pollen Catarrh, Rose Cold, Ragweed Fever, **Rhume des Foins, Corizza da Fieno**); others, again, to the symptoms (Spasmodic Rhino-bronchitis, Rhinitis Pruritus, **Niesieber**, and so on). A term which has been invented by our German colleagues (**Bostock'scher Katarrh**) gives due credit to the observer who first described the affection, while the designation "**Asthme-hay des Anglais**" sufficiently indicates what may be regarded as the "birthplace" of the malady.

The first description of hay fever, as now recognised, did not appear until the year 1819, when an observer named Bostock published an account of "a periodical affection of the eyes and chest," which, in reality, represented a congeries of symptoms which he had observed in his own person.¹

Long before the date of Bostock's communication, however, there had appeared, in various published works, indications that the symptoms of the malady had not passed entirely unobserved, although it is probable, as J. N. Mackenzie has suggested, that the affection was commonly confounded with ordinary coryza on the one hand, and with asthma on the other.

Heberden,² in 1802, stated that he had observed the annual recurrence of "catarrh," in some cases attacking the patient in the summer for a month, in other instances lasting longer. At a still earlier date, namely, in the latter part of the previous century, Cullen³ observed that in some individuals asthmatic attacks were more frequent in the summer—especially during the *dies caniculares*. And if we search still farther back, we find that the medical literature of the seventeenth century (and even that of the sixteenth) reveals passages suggesting the existence of a malady which was either hay fever or, what is essentially the same disorder, "rose cold." In some instances roses are specified as the exciting cause, but in others the attacks are merely described as occurring "in the rose season" or "when the roses are in bloom."

¹ *Med. Chir. Trans.*, London, 1819, vol. x. pt. 1, p. 161.

² *Commentarii de Morborum Historiâ et Curatione*, Londini, 1802.

³ *Synopsis nosolog.*, Londini, 1780.

The earliest reference of this description appears to be that of Botallus (1565), who stated that he had noticed instances in which headache, sneezing, and itching of the nostrils, lasting for as long as two days, had been set up by the odour of roses.¹ About half a century later Van Helmont mentions the case of a certain canon who suffered from asthma during the major part of the summer (*totā aestate propemodum asthmaticus*), but remained free for the remainder of the year, and, indeed, in other respects enjoyed excellent health.² Binningerus (1673) relates the case of a "worthy matron," evidently a lady of substantial proportions (*ampli corporis et carnosi*), who suffered from "coryza" for many weeks during the period when the roses were in bloom.³ De Rebecque (1691), who was himself a sufferer, describes his own case as one in which, for thirteen years, symptoms of coryza had regularly appeared at the commencement of the rose season, and, after lasting during the whole of that period, had spontaneously ceased. He considered that the symptoms were induced by some emanation from these flowers, and termed the affection *coryza a rosarum odore*.⁴ Lastly, Riedlin (1695) describes the instance of one of his friends who suffered from sneezing and catarrh each year during the time when the roses were in bloom.⁵

It would seem, therefore, that although hay fever, like other functional neuroses, has no doubt increased in modern times, the malady was in existence long before its place in the nosology was definitely recognised.

Returning to the year 1819, when the affection was described by Bostock, and tracing the progress made in the general recognition of the malady, we find that another and fuller communication appeared from the same observer in 1826, in which he termed it "Catarrhus Aëstivus," or "Summer Catarrh," and put on record a number of cases.⁶ Bostock

¹ *Commentarioli duo*, Lugduni, 1565.

² *Opera omnia*, Edit. Nov. Francofurti, 1707, p. 346.

³ *Observat. et curat. medicinal. centuriae quinque*, Montbelgardi, 1673.

⁴ *Atrium Medicinae Helvetiorum*, Geneva, 1691.

⁵ *Lineæ Medicæ* (Ann. 1695-1700), Augustæ Vindelicorum, 1697-1701.

⁶ *Med. Chir. Trans.*, 1828, vol. xii. p. 437.

thought the affection was principally due to heat, rather than to any "effluvium" from newly-made hay, although the latter opinion had begun to prevail in the popular mind. M'Culloch remarks, in a brochure published about the same time, that the malady "is produced by hot-houses or green-houses, and in the public estimation it is particularly caused by hayfields;" he also mentions that the term "hay fever" had recently become fashionable.¹ It nevertheless appears probable that the affection had been recognised by this name (at any rate among the classes who suffered from it) for some considerable period before this.

In 1829 Gordon published some observations on hay asthma, but he considered that the affection should be termed "grass asthma" rather than "hay asthma," as it was apparently due to the "aroma" emitted by the flowers of grass, especially by the blossom of **anthoxanthum odoratum** ("sweet-scented vernal grass"), and hay was probably incapable of producing the symptoms.²

In 1831 Elliotson, in his clinical lectures,³ and again in 1839-46 in his work on *Medicine*,⁴ made some interesting observations with regard to hay fever; he was indeed the first to suggest the agent which is now known to constitute the exciting cause. Like the writer just mentioned, he believed that the malady did not depend upon hay, and therefore ought not to be called "hay fever," but that it depended upon the flower of the grasses, and **probably upon the pollen**. Elliotson also considered that the affection was practically confined to the upper ranks of society. He had been informed "that some of the nobility of the very highest order had it," and he had personal knowledge of two unfortunate dukes (not to mention "still higher personages") who annually fell victims to the troublesome complaint.⁵

¹ "Remittent and Intermittent Diseases," London, 1828, vol. i. p. 394.

² *London Med. Gaz.*, 1829, p. 266.

³ *Ibid.*, 1831, p. 411.

⁴ "Principles and Practice of Medicine," London, 1846 (2nd ed.).

⁵ One of these "higher personages" was probably the King (William IV.), who is well known to have suffered from hay fever.

In 1837 Cazenave,¹ of Bordeaux, published a case (evidently one of hay fever), the symptoms of which he attributed to the effect of light. This observer appears to have been the first to suggest "hardening" the nasal mucous membrane by means of the application of caustics, and also to propose the use of goggles to protect the eyes, both of which methods are still practised.

In 1852 Swell (New York)² first described the two forms of the disorder occurring in America, namely, one in the summer and the other in the autumn. Later on, Drake, Kinkler, Price, and other American observers also published reports of cases.

By this time, judging from the literature, interest in the subject had become thoroughly aroused, and during the course of the next twenty-five to thirty years a number of communications appeared from the pens of various observers in England, America, and France. As regards Germany, with the exception of a work by Phoebus, very little appears to have been published until about the beginning of the present century.

In 1859 Laforgue,³ of Toulouse, published some observations which showed that he recognised the neurotic element which is now known to be connected with the malady in many cases; but, like many of the earlier observers, he wandered astray when he commenced to speculate on the exciting cause, which he concluded to be solar heat. Phoebus, the German observer already referred to, published a good account of the malady in 1862, in which he expressed a similar opinion as to the exciting cause, but he considered that the affection was due to some recondite quality possessed by the **first** heat of summer, which the later heat was not endowed with.⁴ It is curious that this writer incidentally mentions an experiment made by another observer, Kirkman, with the actual exciting agent, which produced a positive result (see below, p. 8).

In the subsequent years (1865-1876) works appeared by

¹ *Gaz. Méd. de Paris*, 1837.

² "Diseases of the Chest," New York, 1852.

³ "Observ. de Cat. d'été," *Union Méd.*, 1859.

⁴ "Der typische Frühsommer-Katarrh," Giessen, 1862.

Abbotts Smith,¹ Pirrie,² and Moore,³ in this country; while in America monographs were published by Wyman⁴ and by Beard.⁵ The last-named author adopted the plan of sending out circulars to a large number of patients who suffered from the disorder. From a consideration of the replies which Beard obtained, he decided that hay fever should be classed among the functional diseases of the nervous system. With regard to the actual determining cause of the malady, the answers which he received revealed such a vast collection of alleged exciting agents—the *post hoc ergo propter hoc* fallacy having evidently run riot among the deponents—that Beard concluded, on general grounds, that “the number of special exciting causes of hay fever is very large.”

In 1869 appeared, so far as the present writer can ascertain, the first suggestion that hay fever was of microbic origin. This idea emanated from Helmholtz,⁶ who had found certain organisms in the nasal mucus, which he regarded as vibrios. He thought that although these organisms were present in the nose and the accessory sinuses at periods other than the summer, they became active at that season owing to the stimulus provided by the heat, and that as a result of this activity the characteristic manifestations were set up. The observations of Helmholtz were supported by Binz and Patton; but Kuhn, in 1874, and Pfuhl, in 1878, demonstrated that the alleged vibrios were probably minute portions of granular matter derived from the bursting of the pollen grains.

In 1872 Gueneau de Mussy brought forward a theory, which has since been revived, and is, indeed, at the present moment supported by a large number of observers, that hay fever was essentially dependent upon a gouty disposition, or that the former was a manifestation of a diathesis of this character.⁷

¹ “Observations on Hay Fever, Hay Asthma, or Summer Catarrh,” 2nd ed., London, 1865.

² “Hay Asthma,” London, 1867.

³ “Hay Fever, or Summer Catarrh,” London, 1869.

⁴ “Autumnal Catarrh (Hay Fever),” New York, 1872.

⁵ “Hay Fever, or Summer Catarrh,” New York, 1876.

⁶ Cited Binz, *Virchows Archiv.*, Bd. 46, p. 100.

⁷ “Sur la Rhino-bronchite spasmodique,” *Gaz. heb. de. Méd.*, 1872.

In 1872, also, Wyman published his monograph,¹ in which he pointed out, as Swell had done, that whereas in England there was one common form of hay fever, occurring in May and June, there were in America two varieties, one occurring at the same period as English hay fever (designated as "June cold," "hay cold," etc.), and another developing in the autumn ("autumnal catarrh"). He considered that although a number of causes might produce the paroxysms, the agent which possessed the most decided influence was the plant known as "Roman wormwood" (*ambrosia artemisiæfolia*). He had observed that if susceptible persons approached the plant when in flower, it would in a large number of instances suffice to bring on a paroxysm; also that its flowering period corresponded with the period during which the attack of "autumnal catarrh" lasted. These and other observations lent strength to the supposition that the pollen of this plant might be the real cause.

The further discovery was made by Beard that America could boast of yet another seasonal variety, making a total of three, namely, one commencing in June, another in July, and a third in August.

It was not until the year 1873 that the actual agent which is now known to be the exciting cause of true hay fever, namely, the pollen of certain grasses and plants, was clearly demonstrated, and this achievement stands to the credit of Blackley of Manchester.² In the case of Blackley, as in that of many other authors who have made useful contributions to the literature of the subject, the clinical observer was at the same time the patient on whom the original observations were made. Blackley had indeed been a sufferer from what he terms "this curious affection" for some twenty-five years before his investigations into the nature of the malady were made public. This observer proved by a series of experiments, in which pollen was applied to the nasal mucous membrane, the conjunctiva, and other parts, that the substance produced the characteristic symptoms both in his own case and in that of other susceptible persons, and, moreover, that there was a direct

¹ See reference above.

² Blackley (C. H.), "Hay Fever," London, 1873.

relation between the intensity of the symptoms and the amount of pollen present in the atmosphere. He also succeeded in showing that the majority of the pollen found in the air belonged to the **graminaceæ**.

Blackley next took various assigned causes of hay fever and satisfactorily demonstrated that none of these constituted, of themselves, the exciting cause. Nevertheless Blackley, as well as most other observers, recognised that there also existed a peculiar predisposition or susceptibility on the part of the patient, referable to a general neurotic condition or to some other factor, which determined the individual incidence of the malady. This predisposition will be discussed later (see p. 11).

Although this observer was the first to set the pollen theory on a thoroughly scientific foundation, he was not the first to suggest that the disorder was produced by pollen, for, as we have seen, Elliotson had made this suggestion some forty years previously. Blackley's experiment of applying pollen directly to the mucous membrane had also been anticipated by an observer named Kirkman, who had found that by sniffing up some of the pollen of **anthoxanthum odoratum** all the symptoms of hay fever were induced, even though this was done in the very depth of winter.¹

In 1877 E. J. Marsh, who was an adherent of the pollen theory, published a paper detailing some experiments, performed on Blackley's plan, which showed that "autumnal catarrh" was caused by the presence of pollen from the "rag-weed," or "Roman wormwood" (**ambrosia artemisiæfolia**).²

In the early eighties a certain reaction against the pollen theory began to appear, and propagandists of what may be described as the "pathological" or "nasal theory" commenced to disseminate their doctrines. Thus, between the years 1881 and 1884 Daly, Roe, Harrison Allen, Sajous, and others published articles advancing the proposition that the chief etiological factor was a morbid intra-nasal condition, either in the form of a gross lesion or of an undue sensitiveness, localised or general.

In 1884 there appeared a monograph on hay fever by

¹ Cited Phœbus, "Der typische Frühsummer-Katarrh," p. 137.

² "Hay Fever, or Pollen Poisoning." Read before the New Jersey State Medical Society. Newark, U.S.A., 1877.

Morell Mackenzie,¹ containing a condensed but very comprehensive account of the malady, and written with the lucidity and literary elegance which was characteristic of the author. To the third edition of this work was added an appendix dealing with "Rose Cold," and to the fourth, a short essay on "Paroxysmal Sneezing," which the writer thought might be of interest as a "minor pathological curiosity."

In 1885 Bosworth advanced the theory that, owing to a condition of nasal obstruction, there arose a diminution of the atmospheric pressure in the nasal cavity, and a consequent dilatation of the vessels. This, in Bosworth's opinion, was the primary or fundamental cause of the malady.

In 1888 Edward Woakes brought forward a suggestion that a "necrosing ethmoiditis" was the chief cause of hay fever;² the same observer had already formulated a similar theory in connection with the etiology of nasal polypi.

In 1889 Rualt³ expressed the opinion that hay fever was in reality a reflex neurosis, but that micro-organisms likewise played a part in its production.

In 1890 Greville M'Donald⁴ pointed out that hay fever and paroxysmal coryza were essentially identical, and this statement has since been supported by many other observers.

In 1895 and 1896 the uric acid theory, which has been referred to, received fresh support from Shawe, Lermoyez, Bishop, and others.

Strangeways, in 1897, suggested that hay fever was referable to a **toxin** derived from the protoplasm of the pollen grain, and that the presence of this toxin led to vasomotor paresis, and the latter, in its turn, to various local disturbances.⁵

During the thirty years which elapsed between the publication of Blackley's observations and those of Dunbar, to be next considered, the pollen theory had been the object of more than one dialectical tilt, and among those who claimed to have

¹ "Hay Fever," London, 1884.

² Woakes (E.), "Nasal Polypus with Neuralgia, Hay Fever and Asthma in Relation to Ethmoiditis," London, 1887.

³ *Arch. de Laryngol.*, Feb. 1889.

⁴ "Diseases of the Nose," London, 1890.

⁵ *Ann. of Ophthal. and Otol.*, Jan. 1896; *New York Med. Rec.*, 21st March 1896.

discovered defects in the argument, Sticker, Heymann, Matzus-chita and Thost may be mentioned.

In 1903 Dunbar, of Hamburg, published the results of his investigations with regard to the cause and the treatment of hay fever, and these, as is well known, have attracted a large amount of attention.¹ Dunbar's conclusions fully corroborated those arrived at by Blackley, as to pollen being the exciting cause of the disorder and as to the direct relation between the quantity of pollen in the atmosphere and the intensity of the manifestations.

Dunbar's next procedure was to search for the active principle in the pollen to which the characteristic symptoms were to be referred. He succeeded in isolating a toxic albuminous substance which, when applied to the conjunctiva or introduced into the nose, was capable of producing all the symptoms of hay fever in susceptible subjects. Moreover, by injecting the pollen of certain grasses into animals (*e.g.* horses) Dunbar succeeded in elaborating a serum (now known as **pollantin**) which, when applied to the eyes and nasal cavities of persons who were in process of undergoing the symptoms previously induced by the toxin, caused the disappearance, within a short time, of all these manifestations.

Shortly afterwards, Weichardt, one of Dunbar's former assistants, obtained a serum from animals not previously treated, the fluid being collected from the animal during the period in which the grasses were in flower. This serum, which is commercially known as **graminol** (pp. 39, 68), possesses palliative properties similar to those of **pollantin**.

ETIOLOGY.

Hay fever may be described as an affection, occurring in certain predisposed persons at a particular season of the year, which is characterised by symptoms of nasal and conjunctival irritation, is complicated in many instances by asthmatic attacks, and is immediately referable to the action of the pollen of certain grasses and plants on the mucous membrane of the parts involved.

¹ "Zur Ursache und spec. Heil. des Heufiebers," München, 1903; *Deutsche med. Woch.*, No. 9, 1903; *Berlin. klin. Woch.*, Nos. 24, 26, and 28, 1903.

Predisposing Causes.— Apart from certain known influences which act as predisposing causes, such as heredity, race, social conditions, and so on, there exists an inherent individual peculiarity which renders the patient susceptible to the action of the exciting cause. The exact nature of this susceptibility has not yet been satisfactorily elucidated, but it would appear to consist in some abnormality of the nervous system (leading to an instability of certain centres) or in a peculiar irritability or hyperesthesia of the sensory fibres distributed in the nasal mucous membrane, or finally in a combination of these factors. The possession of the so-called "nervous temperament" (or even the presence of actual functional maladies of the nervous system) does not, of itself, offer a sufficient explanation of the peculiar individual susceptibility; for in some cases the nervous system is apparently in a normal condition, and on the other hand, even in marked instances of nervous debility or of neurasthenia, no manifestations of hay fever are usually to be observed. It appears probable indeed that nervous causes are only capable of acting in an indirect manner, by rendering the patient more vulnerable to certain other influences which constitute the immediate cause. The author is inclined to believe that the explanation of the peculiar abnormality to which the susceptibility is referable will be found to lie in some change in normal metabolism, the effects of which on nerve tissue—as judged by the analogy of certain allied neuroses, and also on other grounds—would be to disturb its proper functional equilibrium, and so lead to the precipitation of the particular reflexes by causes which under normal circumstances would be insufficient.¹

¹ It is occasionally found that a patient will pass a year without an attack, even although the external circumstances, including of course the presence of pollen, apparently remain unchanged, but that in the succeeding years the malady resumes its sway. Also, certain patients cease to suffer from hay fever without any apparent reason; and conversely, the malady may begin at various ages or even comparatively late in life also without apparent reason. The writer considers that the supervention or the abrogation, respectively, of certain faults of metabolism would be a feasible general explanation of these various phenomena; but unfortunately the phrase, as it stands, does not connote anything sufficiently definite to admit of proof or disproof.

As will be seen later, some authors point to certain specific changes, *e.g.* excess of uric acid in the blood, as the determining factor in producing the tendency to instability on the part of the reflex mechanism involved.

A peculiar and unfavourable feature of the predisposition to hay fever is that it tends to become worse with the annually recurring attacks, and that other reflex neuroses, such as asthma, are liable to make their appearance.

Race and Climate.—The British and the Americans are generally considered to be those most frequently affected, but the malady also prevails in France, Germany, Italy, Austria-Hungary, and other parts of the European Continent. Cartaz¹ considers that the statements which have been made concerning the practical limitation of hay fever to the Anglo-Saxon races (or to the fair races in general) is based on defective observation, and he asserts that the affection is equally prevalent among the Latin races; Gradenigo also repudiates the suggestion that hay fever is in any way peculiar to the Anglo-Saxon stock, and states that, so far as Italy is concerned, the malady is quite as common as in other parts of Europe, or in America.² In Germany the complaint is sufficiently prevalent to afford ample justification for the existence of the "Hay Fever Union" (*Heufieberbund von Helgoland*), an association formed for the purpose of collecting and disseminating information concerning the disorder, especially with reference to places where more or less immunity may be enjoyed. The United States has also possessed for some years a similar society ("American Hay Fever Association") with a membership of many thousand sufferers.

The Hebrew race is supposed to be especially prone to hay fever, and Wolff-Eisner cites some statistics from his own observations which tend to support this; he believes nevertheless that other factors, *e.g.* the nature of the occupation (the majority belonging to the class of head-workers rather than to the labouring class) may possess some influence in the matter.

¹ "Maladies du Nez et du Larynx," par A. Cartaz, A. Castex, and H. Barbier, Paris, 1908, p. 68.

² "Sulla Corizza da Fieno." (Paper read before the Royal Academy of Medicine, Turin, June 2, 1899.)

In my own opinion the neurotic factor is probably one of some influence in connection with the occurrence of the disorder among the Hebrews.

It has been stated that the malady does not occur in the negro, but J. N. Mackenzie has reported an instance of this character,¹ and Wyman has recorded the case of an Indian child who suffered from the malady.

With regard to **climate** it may, generally speaking, be said that the malady is found in the temperate zones; and if met with in hot climates, as in Africa, India, and so on, it is found that the British and Americans constitute the bulk of the sufferers. Mere heat is not, indeed, a direct cause of hay fever, although when the appropriate varieties of pollen are present in the atmosphere it may act indirectly, owing to its enervating effect on the patient. In moist, low-lying regions in the tropics, where the most intense heat is experienced, hay fever does not occur, whereas in the upland or mountainous districts, where the vegetation more nearly corresponds to that of the temperate zones, the malady may be observed. In India it is considerably more prevalent in the hills than in the plains, although instances may occur at a certain season in the latter districts. W. Lindley concluded, as the result of enquiries sent to fifty medical practitioners in South California, where the climate is sub-tropical in character, that hay fever did not occur as an indigenous malady, and that persons predisposed to hay fever who came to the country in order to secure immunity, generally succeeded in their object.²

Although innumerable regions of the earth offer an approximately safe chance of immunity to people who are susceptible to the malady, it is only such places as the high seas, the desert, and the region of perpetual snow, that can be regarded as absolutely pollen-free.

Age and Sex.—In the majority of instances hay fever makes its appearance somewhere between the ages of fifteen and forty; but some writers consider that from ten to twenty is the most usual period during which the attacks are first

¹ "Coryza Vasomot. Period. (Hay Asthma) in the Negro," *New York Med. Rec.*, 1884.

² *Southern California Practitioner*, July 1886.

observed. It is not common for the malady to commence before ten years of age, but instances may occasionally be observed between five and ten, and Morell Mackenzie has recorded a case in which the first attack occurred at the age of three, and another in which it took place at the age of two. The youngest patient in my own experience is a boy in whom hay fever developed at six years of age.

As to the development of hay fever in later life, it may be said that it is unusual for the disorder to commence after forty years of age, although cases have been reported in which it first appeared at, or even after, sixty years of age (Garel,¹ Blakeley,² and others).

Garel gives the following table in relation to the age incidence, as observed in 62 cases:—

Below 10 years of age	.	.	.	.	5 cases.
From 10 to 20 years of age	.	.	.	13	„
„ 20 to 30	„	„	.	.	9 „
„ 30 to 40	„	„	.	.	16 „
„ 40 to 50	„	„	.	.	14 „
„ 50 to 60	„	„	.	.	4 „
Above 60	„	„	.	.	1 case.

With regard to **sex**, it is found that males are more frequently affected than females. Phœbus and others give the proportion as 3 males to 1 female; Garel the proportion of 3 to 2. Wolff-Eisner found that out of 72 cases the proportion was 2 males to 1 female.³ In the relative frequency with which the two sexes are affected, hay fever differs from paroxysmal sneezing, in which members of the female sex form the majority of the sufferers.

Heredity.—The hereditary factor is a very noticeable one, and the relative proportion of cases in which the tendency is shown for more than one member of a family to be affected, is variously stated at 20 to 40 per cent. In some instances

¹ "Le Rhume des Foins," Paris, 1899.

² *Loc. cit.*, p. 200.

³ "Das Heufieber," München, 1906, p. 36. The present writer is much indebted to this excellent work.

several members are sufferers from the disorder. These remarks apply to the inclination for the disease itself to be transmitted, but there is also to be observed, in many instances, a family tendency to other reflex neuroses, *e.g.* asthma. It is doubtful, however, whether there is any hereditary "interchangeability" between hay fever and its congener, vasomotor rhinitis, such as may exist, for example, between the latter affection and bronchial asthma (see p. 95). Garel has observed a considerable number of instances in which the relatives of hay fever patients have given evidence of vasomotor rhinitis; on the other hand Wolff-Eisner concluded, from a study of 72 cases, that there was no evidence of any hereditary connection between the two disorders.

With reference to the statement made by some writers, that the family history often reveals an inherited predisposition to nervous affections in general (as shown by the existence of such affections in the direct or collateral lines), it may be said that in view of the prevalence of nervous disorders, especially those of a functional character, among the educated classes, it is hardly safe to assume that there is any special preponderance in this respect in the case of hay fever, without investigating an equal number of similar instances in which hay fever is not present.

Social Position and Mode of Life.—The malady is practically confined to the educated classes, and the bulk of the sufferers occupy a fair social position. I have seen only one instance of hay fever in a working-class patient, although numerous cases of paroxysmal sneezing and rhinorrhœa have been observed in patients belonging to this section of the population; nevertheless even the latter affection is on the whole more prevalent among the better classes.

In regard to the **mode of life** it is found that brain-workers form a considerable proportion of the cases. The statistics collected by Geddings indicated physicians, clergymen, lawyers, merchants, and manufacturers as making up more than half the cases.¹ Medical men are considered by some observers to supply a relatively large contingent of sufferers—about 23 per cent

¹ Quoted J. Wright. De Schweinitz and Randall's "Diseases of the Eye, Ear, Nose and Throat," London, 1899, p. 1145.

in a number of cases reported by Phœbus, and about 38 per cent. in a number reported by Letlaiive.¹

The influence of **constitutional diseases**, such as **gout**, in predisposing to hay fever is discussed below (p. 21). It may be mentioned in this place that **influenza** has been thought to constitute a predisposing cause, both in the case of hay fever and in that of paroxysmal sneezing; but in view of the enormous number of persons who of recent years have suffered from one or more attacks of influenza, it is hardly matter for surprise that a history of the latter malady is frequently to be elicited. No direct connection, at any rate, has been traced between the two conditions so far as the author is aware. It is also to be noted that various **nasal** and **post-nasal** affections (such as mucous polypi, chronic rhinitis, septal deviations, post-nasal adenoids, and so forth) may, in certain instances, be found in association with hay fever, and the rectification of such conditions is sometimes followed by the cessation of the hay fever attacks. In other cases no beneficial effects, so far as the neurosis is concerned, are observed, so that the conditions in question can only be regarded as constituting, under certain circumstances, predisposing or contributory causes.

The **exciting cause** of true hay fever is now known to be the presence on the affected mucous membrane of the pollen of certain grasses and plants. The knowledge of this fact is nevertheless far from being a solution of the whole problem of the nature and pathogenesis of the malady, and the opinions which have been held with regard to this question are very numerous. The writer proposes to discuss the more important of these theories under the following headings:—(1) Atmospheric theories; (2) mechanical theories; (3) microbial theories; (4) nasal or pathological theories; (5) constitutional theories; (6) theories which assume the presence of several causes in combination; and lastly (7) the pollen theory, with its adjunct, the “toxin theory” of Dunbar.

(1) **Atmospheric Theories.**—The suggestion that hay fever is referable to the action of **heat** is a relatively venerable one. Bostock, who, as already mentioned, was the first observer to describe the malady, was of the opinion that heat was the

¹ “De la Rhino-bronchite annuelle,” *Thèse de Paris*, 1887.

principal factor, and many other observers have taken the same view (Eloy, Phœbus, G. de Mussy, Ferber, Beard, Kinneear, etc.). It was observed that in a cool or a wet season the symptoms were less urgent; also that on rainy days, in an ordinary summer, considerable alleviation occurred. But the influence of heat was thought to be assisted by the action of other agents, some believing that a combination of heat and moisture produced the maximum effect, while others considered that a commixture of heat and dryness was the more powerful. Bright light was also thought by many to be a contributory cause. A number of observers, while regarding the temperature as the chief factor, considered that certain emanations from grasses constituted another element of importance.

The obvious difficulty of accounting for the fact that the malady commenced in the early summer, when the weather is not at its warmest, was ingeniously met by Phœbus, who suggested that there was some special influence possessed by the "first heat of summer," which was not possessed by the later heats. This opinion, Phœbus remarks, was supported by the testimony of a large number of reliable observers.

With regard to the heat theory, it may be remarked that although hot weather may in many cases aggravate the attacks of hay fever, there is no proof that heat is in any sense the exciting element. That the severity of the attack corresponds in great measure to the warmth or coolness of the atmosphere is explicable by the circumstance that a relatively high temperature, especially if combined with a certain amount of moisture, favours the growth and evolution of the actual exciting cause, namely, pollen; and also that when the weather is hot the pollen tends to float in the atmosphere, and is then readily inhaled. Blackley has pointed out that in a cool summer, on the other hand, comparatively little pollen is formed, the low temperature being unfavourable to its development. Moreover, the occurrence of rain washes away the offending agent, and it is to these causes, and not to the cooling of the atmosphere, that the assuagement of the symptoms is due.

It is to be noted, also, that in places where a very high degree of heat exists, as, for example, in the desert and on the tropical seas, persons who are predisposed to hay fever remain

unaffected. In the plains of India, moreover, hay fever is not observed in the hottest season, although in the cooler periods it occasionally becomes manifested; in the United States, also, the malady is far commoner in the autumn than in the intense heat of summer. On the high seas, even when the heat is overpowering, the hay fever patient remains immune, except under certain special circumstances unconnected with the temperature. Thus, an attack has been observed to occur in consequence of the patient coming in contact with pollen contained in hay or other material carried on the ship, or owing to pollen being blown from the land, the substance being sometimes conveyed long distances—thirty miles or more—out to sea by the action of the wind.¹

The suggestion that **light** is one of the probable exciting causes of the malady, or is responsible for the exacerbations which are observed, was advanced by Phœbus and others, and has been revived within recent years by Stowell.² The suggestion, nevertheless, appears to be based on conjecture rather than on any verified observations. It is true that bright sunlight may cause sneezing in hay fever patients, and also in other people, but the phenomenon is due to a temporary reflex disturbance owing to stimulation of the optic nerve, or, as some believe, to excitation of the ciliary branches of the nasal nerves.³ In reference to the light theory, the experience of patients at sea may again be cited; for although on the ocean there is often an intolerable glare, it is not found that the latter, even in conjunction with the heat, suffices to produce the attack.

The suggestion that atmospheric **ozone** might be a factor in producing hay fever, or in causing exacerbations of the malady, appears to have been suggested in consequence of certain observations of Schönbein, who found, in the course of his experi-

¹ The writer has recently been informed of an instance in which an attack of hay fever, occurring in a sailing vessel at sea, was attributed to the pollen shaken out from the sails. The latter had previously been lying in a meadow.

² *New York Med. Journ.*, September 5, 1903.

³ Although sunlight has been chiefly accused, in connection with hay fever, it has been considered by Bloom that various forms of artificial light (excluding, however, electric light) may induce the symptoms (*Phil. Med. and Surg. Rep.*, 1886).

ments with this substance, that when air highly charged with ozone was inhaled, a peculiar painful affection of the chest developed, taking the form of a species of asthmatic attack with an accompanying cough. This suggested the possibility that the amount of ozone in the atmosphere might have some bearing on the prevalence of certain catarrhal affections, and even on that of hay fever (Phœbus). The experimental observations which have been made as to this point are not conclusive, either with reference to catarrhal affections, or, as Blackley has shown, with regard to hay fever.

(2) **Mechanical Theories.**—Probably the substance which has been most frequently accused of producing the manifestations of hay fever is **dust**, whether in the form of "house dust" or of "road dust." Gream¹ was of the opinion that the fine dust suspended in the air in dry summer weather was a direct factor in producing the attack. But although almost any kind of dust is capable of acting as the direct cause of a condition closely allied to hay fever, namely, paroxysmal sneezing, it will not produce genuine hay fever unless it contains the special constituent (pollen) which is the exciting element; nevertheless "ordinary" pollen-free dust may doubtless aggravate the hay fever attack, in the same way as heat, sudden changes of temperature, and other factors. Owing to the travelling capacity of pollen, the substance can be carried far and wide, and even in the dust of a large city the substance may be detected during the proper season.

Certain observers, while recognising that hay fever is referable in some manner to vegetation, have been inclined to suspect the **odour** given off by plants rather than the pollen. Blackley therefore tested such odoriferous principles as **benzoic acid**, contained in two of the grasses, and **coumarin**, a fragrant crystalline body, analogous to volatile oils and camphor, which is contained in **anthoxanthum odoratum** and other grasses, and is the substance to which the characteristic sweet scent of new-mown hay is due. He also tried experiments with the volatile oils which give scent to certain plants (*e.g.* peppermint, rosemary, lavender and juniper), but in no case were any manifestations of hay fever set up, and a similar negative result

¹ *Lancet*, 1850, vol. i. p. 692.

followed the inhaling of the odours of various flowers, such as lilies, violets, and so on.¹

(3) **Microbic Theories.**—As mentioned above, Helmholtz was the first to suggest that hay fever was due to a special microbe, but the investigations of other observers rendered it probable that the supposed vibrios, described by Helmholtz, were minute particles of the granular matter of the pollen grains. Various observers have from time to time revived the bacterial theory. Thus Rualt, in 1889, expressed the opinion that although the malady was essentially a reflex neurosis, the presence of a micro-organism (probably the **bacillus subtilis**) possessed an influence in its production.² Sticker,³ a staunch supporter of the bacterial theory, considers that Helmholtz's suggestion of a specific infective agent should not be lightly laid aside, as it affords an explanation of the peculiar course of the malady and of its tendency to recurrence. Sticker also believes that certain prodromal manifestations, which he speaks of as typical of hay fever, would not be compatible with the pollen theory.

Heymann and Matzuschita found large numbers of streptococci in the nasal cavities during the attack, and these they at first considered to have been imported with the pollen; but they afterwards modified this opinion, having come to the conclusion that the organisms represented an increase of bacteria already present in the nose.⁴ Axelos claims to have found, in the nasal mucus and the blood of hay fever patients, a special organism, the toxins of which he considers to be the cause of the attacks.⁵ Weil states that he has discovered a micro-organism in the nasal secretion of such patients, which he failed to find in that of eleven control patients who were not suffering from hay fever. The organism bore a close resemblance to the **micrococcus liquefaciens conjunctivæ**.⁶

¹ Nevertheless the pollen of violets and also that of lilies of the valley (especially the latter) will produce hay fever in some people.

² *Arch. de Laryng.*, February 1889.

³ *Nothnagels Handbuch*, iv. 2, Abth. 2, 1896, p. 90.

⁴ Heymann and Matzuschita, *Journ. Amer. Med. Assoc.*, December 14, 1901.

⁵ *Bulletin de la Soc. de Méd. de Gand*, July 1901.

⁶ *Verhandl. der Gesell. deutsch. Naturforsch. und Aerzte*, 1901, p. 393.

With regard to the microbial theory in general, it must be said that up to the present no observations have been published which can be regarded as proving that the malady is due to pathogenic organisms. The absence of fever¹ and in most cases of a characteristic prodromal stage, the lack of any evidence that the disease can be transmitted from one individual to another, and the usual absence of permanent pathological changes even after repeated attacks, are all against the theory that hay fever is due to specific bacterial infection. The periodicity of the malady, which has led some observers to compare it with malaria and other specific fevers, is entirely referable to the seasonal periodicity of the exciting cause.

(4) **Constitutional Theories.**—That some underlying constitutional peculiarity is in existence which renders the sufferer from hay fever susceptible to the action of pollen, is hardly disputed, and the discussion of the question has hinged rather on the special nature of the peculiarity in question. The influence of certain conditions of the nervous system, and also the effect of arthritism, and especially of gout, have received particular attention, and they may here be referred to.

With regard to the **nervous system**, it is generally considered that the majority of hay fever patients possess the so-called "nervous temperament." This obviously does not imply that such persons necessarily evince a morbid irritability of the nervous system; the inference is rather that they belong mostly to the brisk, energetic type of individual, who is endowed with abundant nervous energy, and whose psychical organisation is the antithesis of that normally appertaining to the phlegmatic type. It is true that the inclusion of hay fever among the reflex neuroses implies that it is a functional disorder of the nervous system; yet in the majority of cases the implication of the latter may in a sense be regarded as local in character, although in certain instances some general neurotic condition is also found to be present.

The "nervous temperament" may be combined with other constitutional or diathetic peculiarities; thus, some authors

¹ As explained below, slight pyrexia may sometimes be observed, but in such instances its mildness is quite out of proportion to the marked local disturbances.

speak of the "neuro-bilious" and "neuro-sanguineous" temperaments, whilst great stress has been laid by certain writers on a combination of the nervous with the arthritic diathesis—the so-called "neuro-arthritic" temperament.

In view of the important vasomotor functions appertaining to the sympathetic nerves, it is not surprising that a number of observers have considered that an abnormal condition of these nerves plays a predominant part in the pathogenesis of hay fever. Bosworth regards a weakening of the vasomotor control, normally exercised on the calibre of the venous sinuses, as one of the factors in the morbid process—the pollen constituting the exciting cause of the attack. Alberts, in his monograph ("Het Pollen-Asthma," Amsterdam, 1903), expresses the view that the affection represents a neurosis of the sympathetic, and that the malady, in its pathogenesis, is akin to Graves's disease. Kinnear concludes that there are two forms of the malady, in one case due to a hyperæmia, in the other to an anæmia of the sympathetic ganglia.¹ Other theories are, that a "disordered functional activity of the nerve centres" is present (J. N. Mackenzie), or that a hyperæsthetic condition of the olfactory and the trigeminal nerves is the chief factor (Hack, Robinson). Fink suggests that an affection of the fifth nerve, with a special implication of its secretory fibres, is the determining cause both of hay fever and of paroxysmal coryza, and claims that the results of treatment support this contention.² The suggestion has also been made that the condition is essentially an "inflammatory neurosis" (Rumbold), or that it is a reflex neurosis set in action by the presence of micro-organisms (Rualt).

Apart from the ordinary nervous element present in many cases of hay fever, there is, in some instances, a peculiar **psychical** influence to be observed. Bosworth considers that only on these grounds can be explained the punctual recurrence of the annual attack on certain fixed dates (or even, according to this author, at the very same hour of the day) which is observed in certain instances—the state of the patient being obviously one of nervous anticipation as the critical period approaches.

¹ *New York Med. Rec.*, 1888, xxxiv. 2.

² *Deutsche med. Woch.*, 1901, No. 46.

There are, in the literature, two well-known instances in which the hay fever attack has been set up owing, apparently, to psychical or "ideo-motor" causes. One of these is reported by Morell Mackenzie, and relates to the case of a lady, a subject of hay fever, who, on the occasion of a visit to the Royal Academy, was so much impressed by a highly realistic picture of a hayfield, painted by Mr. Vicat Cole, that she experienced, almost immediately, a severe attack of her familiar complaint. Whether the attack, in this case, was to be ascribed to the fidelity of the painter's art, or whether, on the other hand, the lady unwittingly passed a hay-cart on her way home, Mackenzie leaves the reader to determine; he himself inclines to the latter explanation, as being the more probable, if also the more prosaic interpretation of the phenomenon. Nevertheless we have it on the authority of Shakespeare that the realism of the painter's art could deceive even the birds of the air—

"E'en as poor birds, deceived with painted grapes,
Do surfeit by the eye, and pine the maw."¹

Or if we reject this example as being too fanciful for scientific purposes, we can find a more academic instance in a case reported by Phœbus, in which the picture of a hayfield was again regarded as the exciting cause of the attack, for the symptoms were set up whilst the patient was gazing at a painting of this description.²

The other instance of the production of hay fever from a psychical cause is the one reported by J. N. Mackenzie, the symptoms in this case being induced by the sight of an artificial rose.³ In describing the case Mackenzie says that while conversing with the patient (who at the time was free from all symptoms of her malady) he produced an artificial rose from behind a screen, where it had been secreted, and, sitting before the patient, held the fictitious flower in his hand, at the same time continuing the conversation. In the course of a minute she said that she felt she was going to sneeze. "This

¹ "Venus and Adonis."

² Quoted Phœbus, *loc. cit.*, p. 30.

³ "The Production of the So-called 'Rose Cold' by Means of an Artificial Rose," *Amer. Journ. Med. Sci.*, January 1886.

sensation was followed almost immediately by a tickling and intense itching in the back of the throat and at the end of the nose. The nasal passages, at the same time, became suddenly obstructed, and . . . in less than two minutes the puncta lachrymalia began to itch violently, the right and afterwards the left conjunctiva became intensely hyperæmic, and photophobia and increased lachrymation supervened." These symptoms were followed by the discharge of a thin secretion from the previously dry nasal passages, and finally by a feeling of oppression in the chest, with slight embarrassment of the respiration. The symptoms, both subjective and objective, were, in fact, exactly similar to those set up in the same patient by real roses. When told that the rose was an artificial one the lady's amazement was great, and her incredulity on the subject was only removed after a close examination of the counterfeit flower. The sequel was curious, for when, on the following day, the lady called again, "she buried her nostrils in a large fragrant specimen of the genuine article, and inhaled its pollen without the slightest tendency to the production of reflex acts."¹

Leaving the question of the nervous influences in hay fever, we may consider for a moment the relationship of the malady to **gout**.

A considerable number of observers, more particularly perhaps on the Continent and in America, have considered that gout or the gouty diathesis, generally combined with a neurotic tendency, is a common and important predisposing cause of hay fever. Gueneau de Mussy, who, as already stated, was the first to bring forward a theory of this description, soon found supporters both in his own country and elsewhere, and papers dealing with the subject, from this point of view, were published by Mollière,² Leflaine,³ Leseur,⁴ Cheatham,⁵ Bishop⁶ and many others. Leflaine considered gout to be the most weighty

¹ It is to be noted that the attacks could be set up in this case by a large number of causes, in addition to roses, so that the central or psychical factor was probably the predominant one throughout.

² "L'Asthme des Foins," *Lyon Méd.*, June 22, 1884.

³ "De la Rhino-bronchite Annuelle," *Thèse de Paris*, 1887.

⁴ "De l'Affection dite des Foins," *Thèse de Paris*, 1895.

⁵ *Amer. Pract. and News*, Louisville, 1890, vol. ix.

⁶ *Phil. Med. News*, February 24, 1894.

of the predisposing causes, and had observed that, during the period of the hay fever attack, the quantity of urine was diminished, and also the amount of urea, while there was, at the same time, an increase of uric acid. Cheatham expressed the belief that the peculiar susceptibility of the hay fever patient was chiefly due to an excess of uric acid in the blood, and Bishop held a similar opinion. Both these observers considered that a peculiar nervous excitability on the part of the patient was also present.

Mounier,¹ who also regards hay fever as being connected with arthritism, believes that a condition of auto-intoxication occurs, with elimination of the toxins by the nasal mucous membrane. Haig is of the opinion that the two chief factors in the causation of hay fever are (1) the presence of vegetation with its irritating pollen, and (2) the presence of heat, or relative heat of a climate, affecting probably "uric acid *collæmia*" and the circulation. "The important point," according to Haig, "is that the proper treatment of *collæmia* and circulation conditions relieves the whole trouble."² It is not quite clear, in connection with this assumed action of heat in the production of hay fever, how it is that the attack can be set up in the depth of winter, provided only that suitable pollen be inhaled; and with regard to the influence of *collæmia* as a causative factor in the malady, whether, in the numerous cases which have been cured by surgical treatment of the nasal cavity, it is to be assumed that the excess of uric acid has been dispersed owing to measures of this description.

With reference to the theory of gout in general, it may be said that although individuals giving evidence of the diathesis in question may of course suffer from hay fever (or, as is more frequent, from asthma or other reflex neuroses), the vast majority of gouty patients are exempt from it; while, on the other hand, many sufferers from hay fever not only fail to

¹ Quoted Cartaz, *loc. cit.*, p. 71.

² Haig (Alexander), "Uric Acid as a Factor in the Causation of Disease," 7th ed., London, 1908. The term *collæmia*, in its general sense, signifies a glutinous or viscid condition of the blood; Haig describes it as an excess of uric acid in the blood, the uric acid being in some colloid form which obstructs, more or less, the capillary circulation all over the body.

show any evidence of gout, but indeed, apart from their annual attacks, appear to be in a normal condition of health. The circumstance that treatment suitable for gout has also relieved or "cured" certain cases of hay fever does not necessarily show that these conditions stand to one another in the relation of cause and effect—although some observers seem to have received this impression; for it may simply imply that some factor in the production of gouty manifestations (*e.g.* faults in metabolism) is also, on occasion, a predominant factor in the production of hay fever, the removal of this factor being therefore followed by beneficial effects in both instances.

(5) **Nasal Theories.**—In view of the fact that in hay fever the attention both of the patient and of the medical observer is chiefly focussed on the nasal cavity, it is not surprising that the organ in question has been subjected to the most careful scrutiny, and that certain observers have come to the conclusion that an abnormal condition of the nasal cavity constitutes the *fons et origo* of the entire trouble. Moreover, it is claimed by the supporters of this theory that numerous patients have ceased to suffer from their malady in consequence of treatment directed to the nasal organ.

Daly, of Pittsburg, appears to have been the first to promulgate a "nasal theory," and among his earlier *obiter dicta* is the statement that a very large number of hay fever patients show well-marked pathological changes in the nose.¹ Adherents of the "nasal theory" were not long in declaring themselves, especially in America, but also, to a lesser extent, in Europe. There was, nevertheless, a certain lack of uniformity in reference to the nature of the lesions to which the malady was thought to be referable. Hack² considered that marked erectile swelling of the mucous membrane of the turbinates was the essential factor; Bosworth³ held that a nasal lesion was present in probably all cases of hay fever, and that the lesion was of an obstructive character and attended by vascular dilatation. Roe⁴ was of the opinion that some demonstrable patho-

¹ *Archives of Laryngology*, 1882, vol. iii. p. 15.

² *Wiener med. Woch.*, 1883, p. 406.

³ "Hay Fever, Asthma and Allied Affections," *New York Med. Journ.*, 1886.

⁴ *New York Med. Journ.*, 1883 and 1884.

logical condition, *e.g.* turbinal hypertrophy, septal spurs and so on, was always to be observed, although the presence of pollen and "other irritating substances floating in the atmosphere" were also factors in the production of the attacks. Thomas¹ was of a similar opinion, while Harrison Allen considered that the malady depended entirely upon an obstructive lesion of the nose, and that all that was required to effect a cure was the removal of the said obstruction.² Roe opposed this statement, and rightly pointed out that but few patients who suffer from chronic nasal obstruction are the subjects of hay fever.³ Grayson, in the last edition of his work on the "Diseases of the Nose, Throat and Ear" (1907), expresses the view that a nasal lesion is "invariably present" and that this should if possible be removed. Holmes⁴ is of the opinion that a chronic nasal catarrh is present in every case of hay fever.

Certain observers have considered that there always exists an abnormal sensibility of the nasal mucous membrane (with or without other lesions), not, however, uniformly distributed throughout the nasal cavity, but confined to certain special areas. But here, again, a divergence of opinion has appeared, and in this case, in reference to the exact site of the hyperæsthetic areas. Thus, Sajous found hyperæsthetic areas on the septum opposite the middle turbinate, and he concluded that irritation of these areas, by chemical or physical agents, led to the sudden suppression of the inhibitory function of the nerve centres governing the nasal reflexes.⁵ J. N. Mackenzie discovered hyperæsthetic areas on the posterior part of the inferior turbinate and the corresponding region of the septum; but he considered that an abnormal excitability of the sympathetic nervous system was the fundamental cause of the malady.⁶ Some other observers have considered that the hyperæsthesia is not limited to any special regions, but that the entire mucous membrane of the nose participates in the condition.

¹ *Rev. mens. de Laryngol.*, 1887.

² *Amer. Journ. Med. Sci.*, January 1884.

³ *New York Med. Journ.*, 1884.

⁴ *Annals of Hygiene and Med.*, November 1907.

⁵ *Phil. Med. and Surg. Rep.*, 1883.

⁶ *Amer. Journ. Med. Sci.*, April 1884.

Joal has made some investigations with regard to the relative proportion of cases showing an abnormal condition of the nasal cavity, and has found that out of a total of 127 cases, 65 showed hypertrophy of the turbinal mucous membrane, while in 116 there was definite hyperaesthesia of the general mucous lining of the nose.¹ Molinié investigated 37 cases, but detected intra-nasal lesions in only 14 of these.²

Not only the nose but also the accessory sinuses have been weighed in the balances and in not a few instances have been found wanting. Apparently the first observer to accuse the accessory sinuses was E. Woakes, who in 1888 suggested that a condition which he termed "necrosing ethmoiditis" was the fundamental cause of the malady. Woakes had already formulated a theory that nasal polypi were due to a similar morbid process; but his views in relation to polypus-formation met with a great amount of opposition, and it appears probable that the process, as described by Woakes, has no actual existence as a definite pathological condition.

More recently, Fink has expressed the opinion that a morbid affection of one or other of the accessory sinuses—more especially the antrum of Highmore—is the essential causative factor.³ He considers that the filaments of the fifth nerve, distributed to the mucous membrane of the affected sinus, are irritated by certain essential oils contained in the pollen, and that the occurrence of this process is sufficient to set up the reflex manifestations which are observed. Another observer, Schadle, states that he has been able to reduce the hay fever attack to a period of eight or ten days, in a number of patients, by irrigation and other treatment applied to the maxillary sinus.⁴

Lastly, it has been contended by Thost that not merely the nasal cavities, but also other parts of the upper air-passages, are in a morbid condition prior to the first appearance of hay fever, and that as a result of the former circumstance the organs in question develop an increased susceptibility to the specific irritant.⁵

¹ *Rev. de Laryng.*, April 1895.

² *Gaz. des Hôpitaux*, 1899, p. 481.

³ *Therap. Monats.*, April 1904.

⁴ *New York Med. Rec.*, May 25, 1907.

⁵ *Verhandl. der Gesell. deutsch. Naturf. und Aerzte*, September 1901, pp. 387, 393.

A considerable number of observers have failed to accept the theory that hay fever is dependent upon the presence of an intra-nasal lesion, and some authors have stated their conviction that in the majority of hay fever patients no obvious changes of a pathological character are to be found. These divergent opinions as to the presence or absence of intra-nasal lesions seem to be largely dependent upon the conception formed by the various individual observers as to what constitutes a "normal" nasal cavity. Owing to the conditions of modern civilised life, it is rare to find a nasal cavity that can be regarded as normal in the anatomical sense. It is certain, for example, that a vast number of people possess a more or less marked abnormality of the nasal septum, in the form of a deviation of that structure to one or other side, sometimes associated with other lesions of a minor character—all, be it noted, without producing any perceptible inconvenience, except in a very small percentage of instances. Yet such lesions would apparently be regarded by certain rhinological idealists as examples of definite morbid conditions and as requiring surgical measures for their rectification.

With regard to the contention advanced by certain supporters of the nasal theory that there is generally, or invariably, a definite pathological condition to be detected in the nose, and that the presence of this abnormality is a weighty factor in the etiology, it may be said (1) that in the experience of many observers no veritable pathological changes are to be detected in the nasal cavities of at any rate the majority of patients who suffer from hay fever—a septum which fails to present a rectilinear outline not being regarded as necessarily pathological; (2) that of the very large number of patients who show obvious structural changes in the nose, only a relatively insignificant minority suffer from the malady in question; and (3) that even in the case of marked intra-nasal lesions occurring in a subject of hay fever, the rectification of the lesion may fail to give relief.¹

¹ Among the observers who have considered that pathological intra-nasal conditions are frequently, or even generally, absent, the following may be cited:—Morell Mackenzie ("Hay Fever and Paroxysmal Sneezing," 4th ed., London, 1887, p. 42); Lack ("Diseases of the Nose," etc., London,

Nevertheless, it must be admitted that there exists in hay fever patients some peculiar condition of the mucous membrane which renders the latter structure susceptible to the action of pollen. The exact nature of this condition is obscure; but that it is essentially dependent upon gross structural changes, or even on a state of heightened sensibility of the mucous membrane, has not, according to the views of many observers, been satisfactorily demonstrated.¹ The evidence, in the writer's opinion, seems to point to the conclusion that intra-nasal lesions are at any rate not indispensable factors in the causation of hay fever, but that in view of the good effects which in many instances have followed the removal of such lesions, the latter are to be regarded as constituting, under certain circumstances, an important predisposing or contributory factor in the production of the malady.

Lastly, it is to be noted that some observers, while of the opinion that pathological intra-nasal conditions are usually absent in instances of hay fever, consider that the reverse is apt to be the case in paroxysmal coryza.²

(6) **Theories which Assume the Presence of Several Causes in Combination.**—French writers have designated the hypotheses which come in this category as "eclectic theories," and it is probable that most observers hold the opinion that no one element or factor determines why some individuals are sensitive to the action of pollen whereas others are exempt, but rather that a combination of elements or factors is usually present.

A well-known continental observer, who is himself a sufferer

1906, p. 251); Cartaz ("Maladies du Nez et du Larynx," Paris, 1908, p. 71); Sticker ("Der Bostocksche Sommerkatarrh," *Nothnagels Handbuch*, 1896); Heymann (*Central. für Laryng. und Rhin.*, vol. xxi. p. 404); Wolff-Eisner ("Das Heufieber," München, 1906, p. 48).

Certain rhinologists consider, moreover, that when structural changes are present, they are in many instances the effect rather than the cause of the malady under discussion (Ball, J. Wright, Lack and others).

¹ With reference to this question of heightened sensibility, Morell Mackenzie reports a case in which there was intense hyperaesthesia of the nasal mucous membrane, with constant sneezing on the mildest provocation; yet the patient was entirely free from hay fever (*loc. cit.*, p. 42).

² Cf. Wolff-Eisner, *loc. cit.*, p. 48.

from hay fever, suggests that some such combination of causes as he has observed in his own case may represent the actual "predisposition" to the malady. These consist in a high nervous organisation, a tendency to "arthritism" in himself and his near relatives, and a local condition represented by a chronic nasal catarrh. One is tempted to speculate that some combination of this kind really constitutes the "predisposition" to hay fever—the nervous organisation representing the suitable soil; the tendency to "arthritism" constituting the outward and visible sign of inward errors of metabolism, these in their turn leading to certain effects on nerve equilibration; lastly the nasal condition representing the inciter of irritability in the peripheral nerve filaments. Moreover, if we assume that in certain instances of hay fever the constitutional factor, in others the local factor, predominates, we may be able to some extent to explain the successful results which have been obtained—on the one hand by diet and constitutional treatment in general, and on the other hand by surgical treatment of the nose.

(7) **The Pollen Theory.**—Although a number of observers had suspected pollen to be the chief factor in setting up the characteristic manifestations, Blackley was the first to place the pollen theory on a logical basis, by adopting the combined methods of observation and experiment; and Dunbar, as well as numerous other observers, have since corroborated Blackley's conclusions as to pollen being the determining cause of the paroxysms.

Blackley investigated the pollen of numerous grasses and cereals, and also that of thirty-five other natural orders.¹ He found, as the result of his observations, that the pollen of the great majority of these various plants would produce the symptoms of hay fever, both in its catarrhal and asthmatic forms, although the severity of the manifestations varied to a certain degree with the different species of plants which were tested, and also to some extent, apparently, with the pollen of the

¹ The pollen of the various plants was tested in a number of ways: by applying it to the mucous membrane of the nose, the mouth, and the throat; by inhaling the substance; by applying it to the conjunctiva; and lastly, by inoculating it into the skin.

same plant in different persons. A further series of experiments, designed to ascertain the character and the quantity of the granules suspended in the atmosphere during the hay fever season, showed that 95 per cent. of the pollen found floating in the air during this period belonged to the Graminaceæ or grasses, and it was concluded by Blackley, and has since been confirmed, that the plants belonging to this order are those chiefly concerned in the production of the malady as observed in England, although the pollen of rye, wheat and other cereals, as well as that of a number of flowers, herbs, and even shrubs (*e.g.* privet), are also capable of setting up the paroxysms.

With regard to flowers, the rose is probably the plant which has been most frequently accused of producing the symptoms which we associate with hay fever; and the term "**Rose cold**" has long been employed in America as one of the designations for the form of the malady which occurs in the early summer. As already mentioned (p. 3), it has been recognised from comparatively early times that in certain individuals roses may produce highly unpleasant symptoms, in the shape of sneezing, coryza, difficulty in breathing, and the like; but it would seem that this idiosyncrasy is far from common, and in this country at any rate it is decidedly rare. When the affection has been observed, it has usually been found that the patient is susceptible to this cause and this alone. There are also certain individuals in whom lilies, violets, and even certain varieties of fruit, such as peaches, are liable to set up manifestations exactly similar to those of hay fever. It has been suggested that in these instances the symptoms are due to pollen still adhering to the fruit or flower.

We come next to enquire how it is that pollen, and especially the pollen of the grasses, is able to produce the manifestations of hay fever. In order to elucidate these points it will be necessary to make a slight excursion into botanical territory.

In the first place it is, of course, well known that the yellow powdery dust observed on the surface of many flowers consists of pollen, and that the function of the substance is to fertilise

the ovule contained in the seed-bearing organ, and so to effect the propagation of the species. But although the same plant possesses seed-bearing structures, as well as anthers or pollen-containing organs, fertilisation is not as a rule effected by this pollen, but a process which is known as "cross-fertilisation" occurs. The reason for Nature's preference for the latter method is that the offspring are better specimens of their kind—superior in height, weight, fertility, and so on. But in order that "cross-fertilisation" may be carried out, the pollen grains must be conveyed from the one plant to the other by some extraneous agency, as they possess no power of spontaneous movement. The method by which the necessary transportation is effected is either the agency of the wind, that of water, or that of insects. The plants which are dependent upon the first method are termed **anemophilous**, those dependent on the second, **hydrophilous**, and those on the third, **entomophilous**. To the wind-fertilised plants belong, amongst others, the pines, poplars, sorrels, the genus *Artemesia*, and the grasses. The second variety, the water-pollinated plants, need not detain us, as this method of fertilisation is only brought into requisition in the case of water-plants, and in but few even of these.

The plants fertilised by insects are provided with various external and internal attractions in order to induce these creatures to visit them and to act as carriers for their pollen. Thus they are often brightly coloured and agreeably scented; or they may possess honey or other delicacies to tempt the palates of their potential visitors. In certain flowers there is a special alighting platform for the convenience of the winged traveller, and in some instances there are even radiating lines on the petals for the purpose of indicating the way to the nectary. It is only to be expected that some reciprocation of these amenities should be provided for, and accordingly there exists, in many instances, a mechanical contrivance which ensures that the bee or other insect shall be well dusted with pollen before it takes its departure.

On the other hand, the grasses and other wind-pollinated plants present few or none of these attractions for the peripatetic insect; and they are obliged to depend, for the convey-

ance of their pollen, chiefly on the lightness of that substance and on the fact that the flowers are carried up on long stalks, so as to be clear of the leaves, thus offering the best chance to the pollen of being carried away by the wind.¹ Moreover, since the chances of individual pollen grains alighting on the stigma of a similar plant are but small, an excessive quantity of the substance is produced, and this is scattered far and wide, and owing to its lightness is sometimes carried long distances. It is not surprising, therefore, that the pollen of these plants readily gains access to the human respiratory organs, even when the recipient resides in the centre of a large city, and that it is able, in susceptible persons, to set up the various manifestations of hay fever.

We may next consider what structural or other characteristic of the pollen grain is responsible for the irritation which the substance engenders in the nasal passages and elsewhere. **The structure of the pollen grain** is that of a nucleated cell, containing a certain amount of granular nutritive material in its general protoplasm (**cytoplasm**). The shape, as also the size of the pollen grains, shows considerable variation ; the granules may be spherical, egg-shaped or triangular, or they may be elongated and cylindrical. The morphological characters of the external surface of the pollen grain also vary, and this may be smooth or be provided with small bristles, spikes or other inequalities.²

The pollen grain possesses, as a rule, two coats, an outer one, known as the **exine**, or **extine**, and an inner one, the **intine** ; there is, in addition, in most varieties of pollen, an external oily covering, but this coating is not so noticeable in the species which usually produce hay fever as in some other varieties. The **exine** possesses a reticulate structure, and takes on the aniline stain. The **intine** is chiefly composed of cellulose and does not stain with the aniline solution. In its substance

¹ Nos. 3 and 7 in Plate I. give an idea of this arrangement of the flowers above the leaves.

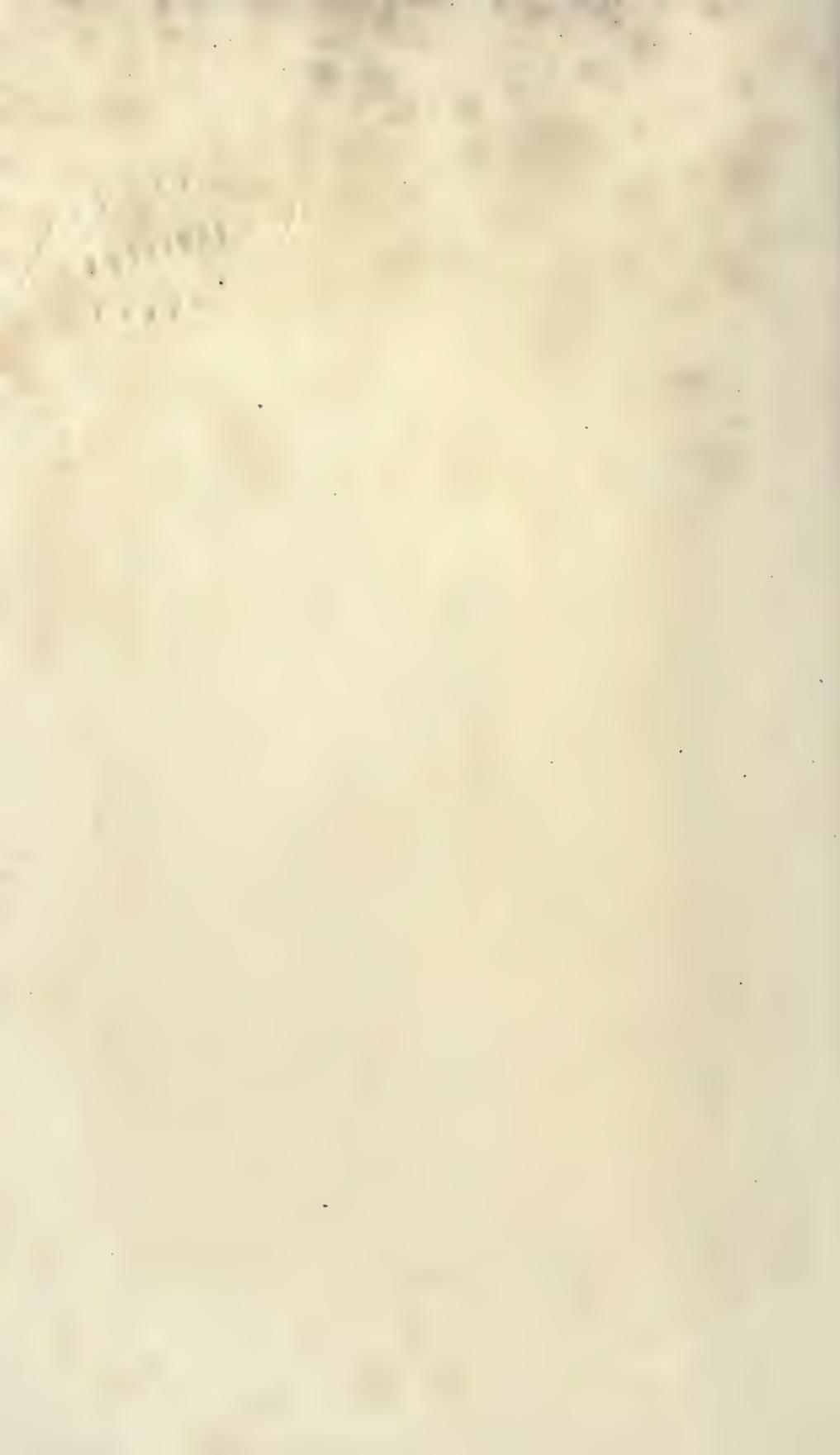
² It is not considered that these surface irregularities have any influence in producing the symptoms of hay fever ; the grains are in fact smooth in the grasses and cereals, which are most concerned in the matter. With reference to the average size of the pollen grain, Morell Mackenzie states that it is about $\frac{1}{10}$ that of a blood corpuscle.



1. 2. 3. 4. 5. 6. 7.

PLATE I.—SOME GRASSES, THE POLLEN OF WHICH IS LIABLE TO PRODUCE
HAY FEVER IN THIS COUNTRY.

1. Sweet-scented vernal grass (*Anthoxanthum odoratum*). Flowers in May and June, and often again in the autumn.—2. Fertile meadow grass (*Poa fertilis*). Flowers about the beginning of June. Not a native grass.—3. Rough-stalked meadow grass (*Poa trivialis*). Flowers from June to the end of July.—4. False oat grass (*Arrhenatherum elatius*). Flowers in June.—5. Perennial rye (*Lolium perenne*). Flowers in May and June.—6. Meadow fox-tail (*Alopecurus pratensis*). Flowers from the middle of April to June.—7. Wood meadow grass (*Poa nemoralis*). Flowers in June and July.



lie a number of small rod-like forms which give the characteristic starch reaction. According to Dunbar, the active toxic principle of the pollen is contained in these small bodies (see p. 36).

The processes which take place in the pollen grain when the latter comes in contact with the mucous membrane are as follows:—The substance, when floating in the atmosphere, is dry and shrivelled, but as soon as it comes under the influence of warmth, combined with moisture (as when it reaches the mucous membrane of the nose or other parts), certain mechanical changes begin to occur, and these have been thought, by some observers, to account, in part, for the manifestations of hay fever. The changes in question consist of the gradual swelling of the granule—whereby it assumes its normal, usually spherical, shape—and in the protrusion of one or more minute projections from the surface. Each projection is formed by a bulging of the **intine**, which penetrates the **exine** and constitutes what is known as the “pollen tube.” This tube is filled with the granular material of the pollen grain, and its physiological function, under the natural conditions, is to ramify through the cellular spaces of the seed-bearing organ until it reaches the ovule, whereupon the tube ruptures and the granular contents are expelled. When, however, the pollen granule finds itself on a mucous membrane instead of on the stigma of a plant, the same phenomenon occurs, and the escaped granular matter spreads itself over the surface of the mucosa, and may possibly become absorbed into the circulation, accounting, in this manner, according to some authors, for the malaise and other general symptoms which hay fever patients may experience.

Whether the manifestations which the pollen produces are due to its mechanical action, or to some chemical or physiological effect, is not perfectly clear. In the writer's opinion the mechanical factor is one of considerable importance, judging from the fact that dust, as also other irritating substances, such as lycopodium, ipecacuanha and certain particles from the leaves of the plane-tree (p. 53), can produce symptoms which may be indistinguishable from those of hay fever and hay asthma. Moreover, in vasomotor rhinitis (which is essentially identical with hay fever, although differing in the nature of the exciting

cause) it is generally held that a mechanical factor is often sufficient to explain the occurrence of the paroxysms. Morell Mackenzie concluded, from the results of experiments carried out on persons not subject to hay fever, that pollen was a peculiarly irritating dust; for the effect of rubbing a small portion of the substance on the nasal mucous membrane of a healthy person was considerably more active than that of tannin, alum, and many other substances of much stronger chemical character.¹

On the other hand, the possibility of some chemical action is suggested by the constitutional symptoms (slight pyrexia, general malaise, etc.) which are sometimes observed, and also by the observations of Dunbar, to which reference must now be made.

Dunbar's Toxin Theory.—The first stage of Dunbar's investigations was concerned with an examination of Blackley's theory, that pollen was the actual exciting cause of hay fever. Without going into the details of this portion of the work, it may be said that Dunbar, like the earlier observer, found that the malady was induced in predisposed subjects by the pollen of certain plants, especially those belonging to the Graminaceæ, Cyperaceæ, and Compositæ. He also corroborated Blackley's observations as to the direct relation between the amount of pollen in the atmosphere and the intensity of the symptoms. Dunbar's next procedure was to endeavour to ascertain the special quality or constituent of the pollen to which the symptoms of the malady were referable. He succeeded in obtaining three definite products from the pollen grain—(1) a peculiar toxic albuminous substance, (2) a starchy substance, and (3) the essential oils. The toxic substance (which was the only one of the products which produced any specific effect) was extracted from the pollen by means of saline solutions and precipitation by alcohol.² It was found to have a marked effect

¹ *Loc. cit.*, p. 51.

² Kamman (*Beitr. zur chemisch. Physiol. und Pathol.*, Bd. v. H. 7 and 8, 1904), after investigating the toxic substance, came to the following conclusions:—The poison belongs to the toxalbumins; it is thermo-stable and is not susceptible to acids, but is affected by alkalies; enzymes do not completely destroy it; when in solution it can be precipitated by completely saturating the latter with ammonium sulphate.

in hay fever patients, even when applied in small quantities, whereas in those not predisposed to the malady no action was to be observed. The nature of the manifestations in the former class of subject varied, of course, according to the organ to which the toxic substance was applied. When instilled into the conjunctival sac, itching, injection of the vessels, lachrymation, and even chemosis would be set up; in the nose, sneezing, hypersecretion and nasal obstruction. If the substance was inhaled, marked irritation was produced, resulting in cough, expiratory dyspnoea and stridor. When rubbed on the skin a marked sensation of itching, together with the appearance of erythematous or urticarial patches, was to be observed. Lastly, when the substance was subcutaneously injected, the whole series of phenomena—nasal, bronchial, cutaneous—together with some cardiac disturbance, was produced.

The amount of the toxic substance necessary to produce symptoms in predisposed persons varied in different cases, but some individuals were so susceptible that such a minute dose as $\frac{1}{40000}$ milligram solution applied to the conjunctiva was found to be capable of setting up obvious symptoms of irritation.

As soon as the nature of the exciting agent had thus, in Dunbar's opinion, been determined, the observer's efforts were directed to the elaboration of a suitable antitoxin; and with this object certain animals (*e.g.* horses) were injected with the toxic substance until an effective anti-serum was obtained. This anti-serum, which Dunbar regarded as a true antitoxin, when applied to the eyes and nasal cavities of patients who were in process of undergoing the disturbances produced by the application of the toxin, was observed to cause the immediate arrest of the disagreeable subjective sensations, and, within a short time, the disappearance of all the objective phenomena which had been set up. The anti-serum, which is now manufactured as a patent preparation known as **pollantin**,¹ consists of the serum of horses that have been inoculated with the toxin. A preliminary injection is first made in order to ascertain if the horse is susceptible to the latter, and

¹ The serum is manufactured by Messrs. Schimmel & Co., Miltitz (Leipsic).

if this proves to be the case, the substance is injected in gradually increasing quantities for a period of two or three months, about which time the formation of the anti-serum usually commences. When a high antitoxin standard has been attained, a suitable quantity of blood is withdrawn, not less than ten days after the last inoculation, and this is then made into serum. Briefly stated, the standardisation of the anti-serum, which is of course necessary in order to gain an idea of the strength of material that is being injected, is effected by determining the degree of dilution with serum, at which a minimum dose of the toxin (ascertained by trial on a person susceptible to its action) is just neutralised.

Although Dunbar considered that the toxic substance, which he extracted, represented a genuine toxin, and that **pollantin** was to be regarded as an antitoxin, it cannot be said that either of these conclusions is to be reckoned as proved. It has been suggested that the active substance which was held by Dunbar to be a true toxin, is in reality an **endotoxin**—a product which does not pass into solution in the body, as in the case of the true toxins (**exotoxins**), and against which the human organism does not build up a protective **antitoxin**. The latter occurrence is a fundamental characteristic of the true toxins;¹ but in the case of the **endotoxins**, not only is no immunity to the specific poison produced, but an actual increase of susceptibility may be developed.² Wolff-Eisner considers that the toxic substance contained in pollen does not produce an antitoxin, but leads to the elaboration, in the blood, of a **lysin**,³ and that the person susceptible to hay fever absorbs the toxic body, whereas the normal individual does not.⁴ Similarly, with regard to **pollantin**, this observer is of the opinion that the serum is not, properly speaking, an antitoxin, but that it produces its effects owing to

¹ Oppenheimer (Carl), "Toxines and Antitoxines." Translated from the German by C. A. Mitchell, London, 1906.

² This increase of the susceptibility is observed in hay fever (see p. 55).

³ A bacterial product which tends to destroy the defensive proteid material contained within the leucocytes of the body.

⁴ Wolff-Eisner (A.), "Die Endotoxinlehre," *Münch. med. Woch.*, No. 3, 1906.

the action of a "colloid substance," which becomes elaborated from it.¹

A very large number of observers in various parts of the world have investigated the question of the efficacy of Dunbar's serum. The first observer in this country to record his impressions as to the effect of pollantin was Sir Felix Semon, and the results of his investigations appeared in the *British Medical Journal* for 1903.² The general impressions, gained from a study of one's own cases and from a consideration of a large number of published reports, are to the effect that, although not a cure in the ordinary acceptation of the term, **pollantin** in a large number of cases has a useful palliative action, and in some instances a species of prophylactic effect. It appears, further, that in probably all cases it requires to be used continuously while the susceptibility lasts, and that in a few instances it may not only entirely fail to relieve the symptoms, but may actually set up irritation. Without troubling the reader with a collection of statistics, it may be said, with reference to the effect of pollantin in the aggregate, that about 60 per cent. of cases experience complete relief, 30 per cent. partial relief, and the remainder no relief.³

Subsequent to Dunbar, another observer, Weichardt, introduced a new protective serum, which he termed **graminol**. Weichardt believed that there existed in the blood of cattle, fed on the grasses ordinarily used for pasture, a substance which might prove to be protective against hay fever. A serum was therefore prepared from the blood of such animals, without any previous inoculations or other preparatory treatment being practised. Weichardt does not claim that **graminol** is an "antitoxin," but merely that it is a serum possessing useful palliative properties in cases of hay fever. The reader is referred to page 68 for further details concerning this preparation.

Certain suggestions which may be classed as **immunisation**

¹ "Heufieber u. seine Serumbehandl.," *Internat. Central. für Laryng. Rhin., etc.*, 1905, p. 402.

² *Brit. Med. Journ.*, 1903, vol. i. p. 713; *ibid.*, vol. ii. p. 123.

³ For the method of using **pollantin** and for some further particulars concerning the remedy, see p. 67.

theories may be briefly referred to. Holbrook Curtis believed that hay fever patients could be rendered more or less immune by the hypodermic injection, or internal administration, of extracts of the plants or flowers which are known to be usually responsible for the attacks. This method was put into practice by Curtis, and he has reported that in a number of cases very favourable effects were observed. Others have also recorded their impressions of the treatment, but the results in the aggregate have evidently been somewhat unequal. Scheppe-grell (New Orleans) has suggested a mode of treatment, based on a similar idea, which consists in causing the patient to inhale pollen for a certain period before the expected time of the attack (see also p. 63).

Billard and Mallet, having observed that a patient was affected by iris powder and also by lycopodium, in such a manner that asthmatic attacks were set up, conceived the idea of trying the effect of injections of the latter substance for the relief of hay fever.¹ It may be mentioned, in this connection, that lycopodium powder, which consists of the spores of *Lycopodium claviatum* and other species (and was indeed at one time known as "pollen"), has been observed to produce mild symptoms like those of hay fever in certain individuals, when employed in the upper air-passages as a vehicle for other substances.

SYMPTOMS AND DIAGNOSIS.

Before discussing the various symptoms and manifestations which are associated with hay fever, some reference must be made to the factors which lead to **variations in the incidence** of the disorder. As is well known, the normal period at which the malady makes its first appearance in England is the late spring and early summer. There are, nevertheless, certain variations to be observed in this respect, which depend on individual peculiarities, and also on atmospheric, climatic, and geographical conditions.

With regard to individual peculiarities, it is found that

¹ *Compt. rend. de la Soc. de Biol.*, No. 27, 1905.

persons living in the same district and under approximately similar conditions may show considerable difference as to the period at which the attack first develops, and, moreover, that there are certain patients, forming, however, but a small percentage of the whole, who, as regards the incidence of the attack, regularly precede the majority of susceptible persons by, it may be, as much as three weeks. These cases are generally of a severe type, and it may be conjectured that the minimum dose of pollen is, for them, less than for the bulk of susceptible individuals. There is also another class of case, which differs from the ordinary patient in the circumstance that the attack is prolonged beyond the usual time, lasting, it may be, from June to September. There is still a third variety, in which an ordinary attack is manifested at the usual period, and a second, usually of a milder character, in the autumn.¹

The influence of the climatic and geographical factor is shown in the time of occurrence in the southern, as compared with the northern, parts of Europe, the attack often beginning as early as April in Southern Italy, whereas it is delayed until the latter part of July, or even later, in certain regions of Northern Europe, as, for example, in parts of Norway. Also, it occurs later in elevated, and especially in mountainous, districts than in the plains.²

The variations in the date of onset of hay fever, and also the fluctuations which may occur from day to day when the attack is in progress, are—if individual peculiarities be discounted—to be regarded as dependent on the relative amount

¹ It is not quite certain what species of pollen is responsible for these second attacks. There are two possible sources, namely, the second crop of grasses, and certain of the cereals. The great majority of patients are not affected by the former, having presumably secured a species of temporary immunity, but some individuals are known to be susceptible to the pollen of cereals, with or without a susceptibility to the pollen of the ordinary grasses.

² Raugé records an instance in which a patient made an excursion to an elevated region during the height of an attack, and found that as soon as an altitude of 1000 metres was reached the symptoms entirely disappeared, only to return, however, when the patient descended again to between 400 and 500 metres (*Central. für Laryng. Rhin., etc.*, 1908, p. 354).

of pollen which is present in the atmosphere. The factors which influence the production and dissemination of pollen possess, therefore, a practical interest for the person predisposed to hay fever, and may here be indicated.

In connection with the variations which are observed in regard to the annual period of onset, it is to be noted that under ordinary circumstances the grasses, which as we have seen are the principal offenders, reach maturity about the month of June; but the character of the weather, in a particular year, will materially influence the flowering process, causing it to be earlier or later according to the atmospheric conditions which prevail. Thus with favourable weather this process and, as a corollary, the dissemination of pollen may commence in May, whereas when the season is cold and wet it may be delayed until July; and the incidence of the hay fever attack will be influenced in a corresponding manner.

Next, there are the daily fluctuations in the quantity of pollen to be considered. The latter is especially influenced by temperature and moisture, a suitable combination of these elements, that is to say, a high temperature with a fair amount of moisture, being conducive to the growth of vegetation and to the production of pollen. On the other hand, a low temperature interferes with the normal flowering process, and thus hinders the generation of the substance; rain also, apart from its ordinary effect on the temperature, tends to wash away the pollen in the air. Lastly, the strength and direction of the wind is a factor which in some instances requires to be taken into account.

With reference to the **quantity of pollen necessary to produce hay fever**, it is to be noted that although the substance is present in the air in small quantities before the attack becomes manifested, and the amount necessary to be inhaled before symptoms are induced is exceedingly minute, there is nevertheless an approximate minimum, and if the quantity inhaled is below this amount no symptoms will be set up. Blackley puts the quantity which, if inhaled, will produce marked symptoms, at the diminutive figure of about $\frac{1}{3427}$ gr. in the twenty-four hours; he found, indeed, that mild symptoms were produced when only $\frac{1}{40000}$ gr. was inhaled in

the same period; less than the latter amount produced no symptoms.¹

The **symptoms** of hay fever show considerable variation in different individuals, in regard to their manner of onset, their intensity and duration, the relative severity of the various local manifestations, the tendency to bronchial involvement, and in other respects. In view of these differences the writer proposes to give, in the first instance, a general description of the attack as commonly observed, and afterwards to discuss the various phases of the malady somewhat more in detail.

The **initial symptoms** of the attack are frequently represented by a sensation of itching and burning at the inner canthus of the eye; or a similar irritation may be felt in the fauces and naso-pharynx. In certain instances the actual attack is preceded by certain mild constitutional or local disturbances (p. 46) which commence a few days or hours before the former develops; but in most cases no such prodromal indications are to be observed.

Following upon the initial signs of irritation, certain **nasal manifestations** are to be observed, these appearing as a feeling of irritation in the nose, soon succeeded by paroxysms of sneezing and by a profuse discharge of clear fluid. The attacks of sneezing are often violent and prolonged, the act being repeated, it may be, twenty, thirty, or even a hundred times in succession, and sometimes leaving the patient in a disagreeable, cold perspiration. As the malady progresses, the secretion from the nose becomes thicker, and may finally assume a mucopurulent character. The mucous membrane becomes congested and swollen, and the nasal passages obstructed, so that, when this symptom is fully developed, the patient may be quite unable to effect nasal respiration. It is often observed, however, that if the patient lies on one or other side, the obstruction is liable to shift from the nostril which is uppermost, leaving that cavity more or less free. The sense of smell and taste may be temporarily affected owing to the mechanical obstacle to olfaction; but, apart from this, the sense of smell in hay

¹ One grain, by weight, of pollen contains on an average about 6,032,000 individual pollen grains.

fever patients usually remains unimpaired, and may even be more acute than normal, in which respect it offers a contrast to the condition as observed in cases of acute rhinitis.

In the meantime, in most cases, trouble is being wrought **in the eyes**, and there occurs profuse lachrymation, with more or less congestion of the conjunctival vessels, and in some instances of the ciliary vessels, these objective symptoms being accompanied by pricking or smarting sensations in the affected organ. The patient may complain, in addition, of frontal headache or of a feeling of constriction above the eyes, or in some cases of pain in the eyeball or over the head. A certain amount of intolerance of light may also be present. Some redness in the region of the alæ and tip of the nose is often to be observed, and in a marked case the entire face may appear congested and swollen. In severe attacks some chemosis may occur.

The foregoing symptoms generally take two or three days to develop, and during the course of the attack they usually exhibit a remittent or intermittent character. The symptoms also vary in intensity in different persons, or even in the same individual, at different times. Thus, in a mild case, the attack may be represented by slight irritation in the eyes or the nose (or more commonly in both organs) which occurs intermittently, being only in evidence, for example, when the patient goes out of doors or into the fields. On the other hand, in a severe case, the patient may run through the whole gamut of symptoms, and may obtain little or no relief so long as the critical period lasts.

In those cases in which **asthma** develops, the symptoms usually become manifested when the oculo-nasal disturbances are at their height, and the latter are then apt to become less marked and to disappear, while the asthma increases in severity. Nevertheless the asthmatic attack sometimes appears at the same time as the other signs of hay fever or even before them, or the bronchial disorder may exceptionally constitute the sole affection. In many instances asthma does not make its appearance until the patient has had a considerable number of annual attacks of the oculo-nasal form of the malady.

The attack of hay asthma, like the ordinary form of the malady, occurs especially at night, although the first definite

paroxysm, according to some authors, generally takes place in the daytime. The symptoms of cough, expectoration of mucus—at first scanty and tenacious, afterwards more abundant and frothy—and dyspnoea, together with the presence of sibilant and sonorous râles, correspond to those usually observed in ordinary bronchial asthma. The duration of the paroxysm is variable, the attack sometimes lasting only a few hours, while in other instances it is practically continuous during the whole of the hay fever period, or recurs whenever the patient is exposed to a sufficient dose of pollen. In mild cases, or at the commencement of the asthmatic phase, there may be little more than a certain amount of "tightness of the chest," together with some cough and expectoration.

With regard to the symptoms which may be manifested in the **throat or other parts**, it may be said that in the first-named region some degree of irritation is in some cases experienced (apart from the itching already referred to), and the condition may in certain instances spread up the Eustachian tubes and lead to slight deafness and tinnitus.

In some patients there is considerable cutaneous irritation, as manifested by itching of the skin of the face (occasionally located under the chin), or of that of the neck, the scalp, or other parts. Urticular eruptions may also be observed (p. 48), and herpetic vesicles sometimes appear on the lips.

Among **other symptoms and effects** which may be observed are lassitude, prostration, depression—mental and physical—sensations of "chilliness," and in exceptional instances slight pyrexia. The paroxysms are also said to be signalised, in most cases, by diminution in the quantity of urine, with abundant deposit of urates and decrease in the amount of urea.¹ As a rule, neither the pulse nor the temperature is

¹ A. Wolff has made some observations as to the state of the blood in hay fever, and reported an increase of the eosinophile cells during the period of the attack, whereas in the interval when hay fever was absent this phenomenon was not noted. Similar observations have also been made in connection with bronchial asthma. (The present writer has failed, in spite of a careful search, to find Wolff's original communication on this subject; the reference is given on the authority of Wolff-Eisner, *loc. cit.*, p. 46.)

raised during the course of the attack, although in a small proportion of cases there is a slight acceleration of the pulse, which persists throughout the critical period. Some patients complain of palpitation occurring on exertion, and the majority of patients exhibit an acceleration of the heart's action during and after a severe paroxysm of sneezing.

Course and Duration. — In most cases the symptoms, whether oculo-nasal or bronchial, exhibit an intermittent character, and the paroxysm, after lasting from a few minutes to several hours, subsides, but only to recur again at some later period. Nevertheless, in certain instances any such intermissions can only be obtained by the patient confining himself to the house during the whole of the critical period. The ultimate subsidence of the malady, like its onset, generally occurs in a gradual manner, corresponding with the diminution of the special irritant in the atmosphere. The duration of the hay fever attack is usually about three or four weeks, but it may last somewhat longer, or may even persist for three months. A second milder attack is occasionally observed in the autumn (see p. 41).

Before leaving the subject of symptomatology, it will be desirable to refer in rather more detail to certain points to which allusion has already been made.

It was stated at p. 43 that certain premonitory or **prodromal symptoms** may occasionally be observed. These have been described by Sticker and others as consisting of such derangements as a feeling of languor or general weakness, loss of appetite and other evidences of digestive disturbance, depression of spirits, and various general symptoms, with, exceptionally, a slight elevation of temperature. Although it appears probable that except for some slight malaise occurring before the attack, genuine prodromal symptoms are uncommon, there is no doubt that in occasional instances a veritable prodromal stage may be observed, and various explanations have been advanced to account for the phenomenon. Sticker himself, who inclines strongly to the "microbic theory" (p. 20), considers that the prodromal symptoms are analogous to those which occur in the specific infectious fevers. On the other hand, Dietsch makes the very original suggestion that the

explanation of these symptoms (which he nevertheless regards as exceptional) lies in the "unaccustomed warmth" of early summer; in the debilitating atmosphere of the season (*angreifenden Frühlingsluft*), and also, in some cases, in the psychical depression due to the anticipation of the dreaded attack.¹ Wolff-Eisner, who, like Dietsch, considers prodromal symptoms to be unusual, suggests that such manifestations as Sticker describes are in any case not characteristic, since certain neurotic and debilitated individuals not seldom give evidence, in the spring, of disturbances of this description. Blackley thought it possible that some of the granular matter, escaped from the pollen grains, made its way through the walls of the capillaries into the blood-current, and owing to defective elimination set up constitutional disturbance.

Coming next to the characteristic **intermission of the symptoms** which is observed in hay fever, it may be said that this phenomenon is chiefly referable to the varying amount of pollen in the atmosphere and to its occasional absence, as, for example, after a rain-storm. There are, in addition, a large number of secondary causes which serve to precipitate the paroxysms under particular circumstances. Among these, the more important are the disturbance of dust which contains some admixture of pollen; probably, also, in some cases, dust of any kind. Tactile impressions or sudden stimulation of the special sense organs (olfactory, ophthalmic, auditory) are also fruitful sources of trouble.

It is frequently noticed that an attack occurs soon after waking in the morning, and it is probable that in such instances more than one factor comes into play. There is, in the first place, the reappearance of the reflex excitability, which during sleep is more or less in abeyance. The first admission of bright light into the bedroom may also exert an influence, but the most important factor is probably the stirring up of dust which has settled on the coverlet and elsewhere—the nasal reflexes being now alert, and, as it were, ready for the fray.

Some patients find that cutaneous impressions, such as those produced by combing the hair or by suddenly stepping on a

¹ *Deutsche med. Woch.*, February 14, 1901.

cold floor with bare feet, may precipitate an attack.¹ But the occurrence of a sudden noise, a fit of laughter, a current of air, as well as numerous other disturbances of a trivial character, may suffice to set up a paroxysm. It is also to be noted that an attack may be set up in susceptible persons owing to their being visited by someone who has recently come in contact with pollen dust, as in passing through a hay-field or some other pollen-ridden locality.

The quantity of pollen in the air of an ordinary dwelling-house being very small compared with that in the external atmosphere, the worst paroxysms are naturally liable to be set up when patients go out of doors, and, above all, if they go into such places as a meadow, an open wood, or the like.

The aggravation of the attack, when this is already in progress, may be brought about by causes, many of which are similar to those already mentioned, such as excessive heat, dust, sudden changes of temperature, etc. Over-exertion, or violent exercise in the open air, as in playing a hard set at tennis, is also liable to lead to exacerbations, or to aggravate a mild attack which is already established. This is, of course, explained by the great difference in the amount of air and of pollen which is inspired when exercise is taken, as compared with that inspired when the body is at rest.

Certain variations in the **relative implication of the eyes and nasal cavity** are to be observed in different cases. In most instances both ocular and nasal symptoms are present; in certain other instances only the nose is involved, or the ocular symptoms are so slight as to be scarcely noticeable; in a small percentage of cases the eye is the only organ perceptibly affected. With regard to the organ which is first attacked, it may be said that in the majority of cases the eye and the nasal cavity are simultaneously affected; sometimes, however, the symptoms begin in the nose, and in a few cases the attack is ushered in by objective eye symptoms.

It is generally considered that some relationship exists between **hay fever and urticaria**, although the exact nature of the connection is obscure. We find, for example, that a

¹ Plunging the hands into cold water may, on the contrary, have the effect of relieving an attack.

certain number of hay fever patients also suffer from attacks of urticaria, either during the critical period or at other seasons of the year. Moreover, as stated in connection with the subject of Dunbar's toxin (p. 37), the injection of the pollen poison leads, among other effects, to the production of an urticarial rash. There is also evidence, in an appreciable number of instances, of a disposition to cutaneous manifestations of this character in the near relatives of hay fever subjects. Lastly, there appears to be some evidence that urticaria and hay fever possess a certain interchangeability. Thus it has been observed that an individual suffering habitually from the latter malady has in one particular year suffered from urticaria during the hay fever season, and for about the same length of time, the disorder, which usually occurred during this period, holding entirely aloof.¹

Autumnal Catarrh.—In the edition of Bosworth's work on the "Throat and Nose" which appeared in 1897, the author stated that autumnal catarrh was to all appearances an exclusively American disorder, and apparently the same assertion can be safely made at the present time. Although this form of the malady undoubtedly corresponds to that which is observed in Europe in the spring and early summer, it is not quite clear why Americans should suffer in such far greater numbers from the autumnal form than from the other variety, since the Graminaceæ are to be found in America no less than in Europe. It is true, on the other hand, that the plants whose pollen is responsible for the autumnal attack grow luxuriantly in North America, whereas they are absent or sparsely scattered in Europe. The chief offender is generally considered to be the "Roman wormwood" (*ambrosia artemisiæfolia*), often called "ragweed," which begins to flower about the middle of August, or somewhat later, and continues in blossom until the end of September. The pollen of such species as Golden Rod (*solidago*) has also been considered to be capable of setting up autumnal catarrh in certain cases. Moreover, the pollen of asters and chrysanthemums have been stated by Dunbar and others to be able to produce the manifestations of the disorder, although it would seem that, at any rate for the greater number of susceptible persons,

¹ Cornaz, *L'Echo Médical*, No. 7, July 1860.

they are inactive. The absence or rarity in Europe of the plants which commonly set up the American form of the malady would help to explain the non-occurrence of autumnal catarrh in the former continent.

The symptoms of autumnal catarrh are similar to those of hay fever, although possibly of a more severe type on the average. It would seem that pollantin usually acts in an efficacious manner, as in the case of ordinary hay fever.

Beard has described three forms of the malady as occurring in America, namely, one occurring in June, another in July, and a third in August. More recently Dunbar and others have also drawn attention to the existence of three forms of the disorder in America: a few unfortunate patients apparently run through the whole gamut.

DIAGNOSIS

The differentiation of hay fever from paroxysmal sneezing, although usually a simple matter, may, in certain cases, present considerable difficulty, as also may the distinction of the former malady from bronchial asthma, with or without accompanying nasal manifestations. The symptoms which may be regarded as pointing more especially to hay fever are the abrupt onset of the attack at a particular season of the year,¹ the implication of the conjunctiva, with, in many cases, the presence of other signs, such as swelling and congestion of the eyelids, and so on. It is, of course, not so much in cases in which the symptoms are fully developed and conform to the ordinary type that difficulties in diagnosis are to be anticipated, but rather in atypical cases, especially when in an early stage. As examples of such cases, there may be mentioned those instances in which the symptoms do not begin simultaneously in the eyes and nose, but are chiefly or entirely limited to one or other of these organs. Under these circumstances a local

¹ Under very exceptional circumstances a genuine hay fever attack has been observed to occur even in the winter, as when the patient has come in contact with pollen contained in a sack of hay or the like. Old pollen, however, possesses far less potency than the substance when fresh (*cf.* also Kirkman's experiment, p. 8).

affection of the conjunctiva or an acute nasal catarrh may be suggested. In exceptional instances the asthmatic symptoms are the first to develop, or these may, as already stated, constitute the entire affection.

There is, moreover, a certain number of individuals who appear to occupy an intermediate position between those who are susceptible to pollen in the ordinary way and those not susceptible at all. The individuals in question, although they may not be liable to nasal affections in general, are apt to suffer from obstinate attacks of nasal catarrh in or about the month of June, and for such patients the ordinary remedies for catarrh are of little or no avail, the ailment continuing to run its course, and finally, in the course of a month or so, disappearing spontaneously. Certain cases of this character give a slight objective reaction when tested with the pollen toxin; or the reaction may be simply subjective, consisting of a sensation of itching or burning after the test solution has been applied. It would appear, therefore, that cases of this description are to be regarded as very mild instances of hay fever.

The affection which presents the closest resemblance to hay fever is paroxysmal sneezing (vasomotor rhinitis); in fact, as already pointed out, the maladies are essentially one and the same pathological condition, but in view of the different treatment which is generally required in the two instances, their differentiation is desirable. The history of the case will be of value in most cases, and it will often be found that in paroxysmal sneezing the symptoms come on with a certain regularity or periodicity (occurring, it may be, each morning as soon as the patient rises), but taking place without any reference to the season of the year. The nasal symptoms, in the two conditions, do not show any characteristic differences; but the eye symptoms observed in hay fever are usually absent or less marked in vasomotor rhinitis. Nevertheless there are still certain cases of the latter affection, especially when occurring during the hay fever period, that may be not a little difficult to distinguish. For such as these the diagnostic solution prepared by Messrs. Schimmel & Co. may, if necessary, be employed. This solution consists of a trituration of 2 mgram. of pollen toxin with 18 mgram. of chloride of sodium, which is dissolved in distilled

water, and before being applied to the conjunctiva is diluted to 1 in 50,000 or 1 in 100,000. In most cases of hay fever a subjective as well as an objective reaction will be observed. The former, consisting of itching, burning, and other abnormal sensations, occurs within a few seconds ; the objective appearances take a few minutes to develop. These either remain limited to the eye (which shows injection of the vessels, etc.), or they are succeeded by sneezing and other nasal symptoms, and in certain cases by asthma. The application of **pollantin** will arrest most of the discomfort, but this remedy should always be applied as early as possible, that is, as soon as there are definite signs that the patient is susceptible to the action of the pollen toxin.

The application of this solution does not constitute an infallible test, as in a few instances of undoubted hay fever the action of Dunbar's pollen toxin has no effect, and conversely, a reaction may be observed in subjects not apparently predisposed to hay fever.

Apart from the peculiar borderland cases to which reference has been made, there is, of course, a certain number of individuals, suffering in many instances from some slight chronic affection of the nose, who give evidence of attacks of acute rhinitis in the spring and early summer—especially when changeable atmospheric conditions prevail, as well perhaps as at other periods of the year. The distinction of such cases from hay fever should not, as a rule, prove difficult, in view of the dissimilarity in onset and course of acute nasal catarrh, in the absence of eye symptoms, or in their relatively slight character if present, and lastly in the effects of treatment appropriate for the inflammatory affection. Moreover, on examining the nasal passages it is found that the swollen mucous membrane presents a more highly congested appearance than is usually the case in hay fever.¹

¹ It is to be noted that some forms of dust are liable, especially in certain individuals, to induce manifestations in the eye and the nasal cavity which bear a considerable resemblance to those of hay fever. An example of this kind is the dust from a railway train, which will sometimes in the course of a journey set up symptoms very like the first stage of the latter malady. B. Fränkel has given these manifestations a place in the nosology under the name of *Eisenbahnschnupfen* ("railway coryza").

When the hay fever attack is ushered in by symptoms of asthma, or is mainly represented by manifestations of this character, difficulties in diagnosis may also arise, especially in view of the fact that ordinary bronchial asthma may in some instances be associated with paroxysms of sneezing or with other nasal symptoms. The history of the case will here again be of value in supplying evidence that the attacks are connected with a definite season of the year. With regard to the mode of onset of hay asthma, certain observers have stated that the first attack usually occurs in the daytime and in the open air, whereas ordinary asthma generally seizes the patient when indoors, and in the evening or at night. In its course hay asthma differs somewhat from the ordinary variety, for there is a tendency for the former to be more or less continuous during the hay fever period, although certain remissions or intermissions may be observed; in bronchial asthma, on the other hand, intermissions are more frequently in evidence. In those cases of bronchial asthma in which the symptoms are associated with attacks of paroxysmal sneezing, the manifestations of the latter affection are, as a rule, less severe than when forming part of the hay fever attack, and, in addition, the conjunctival mucous membrane is not implicated as in the latter malady. In connection with diagnosis, mention may be made of a curious affection, the symptoms of which are practically indistinguishable from those of hay fever, although it is not referable to pollen. Instances of this disorder have been reported by Rosenfeld, who states that it is of fairly common occurrence in Stuttgart, where the affection is known by terms corresponding to "plane-tree coryza" and "plane-tree cough" (*Platanenschnupfen*, *Platanenhusten*). It affects a number of predisposed persons annually, and the time of incidence corresponds with the flowering period of *platanus occidentalis* and *p. platanoides*. The symptoms consist of coryza and conjunctival irritation, together with tracheal discomfort, and finally, bronchial spasm. The actual irritant is apparently the small stellate hairs or spikes from the posterior surface of the leaf.¹ A French observer, Guinard, has comparatively recently

¹ Rosenfeld (G.), "Ueber einige Ursachen von Husten und Schnupfen," *Berl. klin. Woch.*, No. 9, 1903.

reported a severe case of paroxysmal sneezing seemingly due to the same cause.¹

Szohner² and J. N. Mackenzie³ have each reported cases, described as hay fever, in which the manifestations took very unusual forms. In Szohner's case the symptoms were somewhat of an influenzal type, and the malady was observed to commence with the hay harvest and to last twelve weeks. For the first six weeks the symptoms were those of rhinitis and bronchitis, and during this time Szohner could discern various particles (*Kerne und Stiele*), derived from the grasses and clovers, in the secretion obtained from the nose and bronchial tubes. During the remaining six weeks asthma was in evidence.

The case reported by J. N. Mackenzie is designated as "a hitherto undescribed neurosis of the aural apparatus," and apparently represents a species of "hay fever in the ear." The patient, a lady aged 42, suffered every summer from attacks of itching in one ear with swelling of the soft parts lining the external auditory meatus, together with increased secretion. There was at the same time congestion of the naso-pharynx on the corresponding side and a feeling of irritation in the throat. These attacks began suddenly and were renewed almost daily, and after persisting for a month or thereabouts, spontaneously ceased. Mackenzie sent the patient, just before one of the annual attacks was due, to a place in which immunity from hay fever could be secured, and there was no attack that year, although for the previous twenty-two years the symptoms had annually recurred.

The observation of this case was evidently not an isolated experience, as Mackenzie had previously referred to the phenomenon at the annual meeting of the American Laryngological Association in 1886.

Lastly, it would appear from some observations of Sticker⁴ that in certain rare instances local disturbances exactly resembling those of hay fever may occur as a pure and simple

¹ "Crises d'Eternument provoquées par des Poils de Platane," *Soc. Méd. de Lyon*, May 11, 1909.

² *Pester med. Chir. Presse*, No. 16, 1892.

³ *Internat. Journ. Med. Sci.*, February 1889.

⁴ *Nothnagels Handbuch*, iv. 2, Abth. 2, 1896.

manifestation of hysteria. (*Cf.* the case of paroxysmal sneezing described at p. 105.)

PROGNOSIS

Among the favourable points which may be cited in connection with the prognosis of hay fever are the circumstances that the malady is not serious or dangerous to life, and that in the great majority of cases no structural changes are left either in the nose, the eye, or the bronchial tubes; also, that in most instances the malady can either be cured by judiciously selected treatment, or so greatly relieved that the patient is able to regard the onset of the periodic attack with comparative equanimity.

On the other hand, unfortunately, there is almost no tendency to spontaneous cure, such as may be observed, for example, in cases of paroxysmal sneezing and in certain other neuroses, and the malady, in the absence of effective treatment, not only tends to recur year after year, but also shows a disposition to become aggravated in severity as time goes on.¹ It is true that in a few cases the affection disappears spontaneously, but the proportion of such cases is probably insignificant, if we except the instances in which the disorder exhibits a tendency to decline in later life.

The length of time the disease has lasted before the patient presents himself for treatment does not appear to be such an important factor as might be expected, and a person who has been affected for a considerable number of years may possess as favourable a chance of being permanently relieved as one who has only suffered for a year or two. Nor, apparently, does the fact that hay asthma has become established necessarily render the possibility of ultimate cure more doubtful. Unfortunately the reverse of this also holds good, and a patient in whom the malady has been present only a relatively short time, and who is not affected with asthma, may prove exceedingly difficult to cure. Nevertheless, other things being equal, a

¹ Bärwald (quoted Wolff-Eisner, *loc. cit.*, p. 44) points out that certain patients also develop, in the latter part of a season, a susceptibility for the pollen of plants which at first did not affect them.

younger patient has, on the whole, a better chance than an older one.

It is considered by some observers that the prognosis is most favourable in those patients in whom some definite obstructive lesion of the nose is present, due, for example, to hypertrophy of the turbinates or to a deviation of the septum, as the rectification of a lesion of this character frequently results in a cure.

In certain cases no known method of treatment is of any avail except entire removal from the influence of pollen, by means of a sea voyage or some similar method.

Complications or **sequelæ**, especially those of a serious character, are fortunately very uncommon.¹ In the majority of severe cases there is nevertheless a greater or less degree of deterioration of the general health as a result of the annual attack; the patient may, for example, lose as much as a stone in weight and may suffer from considerable debility, lasting a month or longer, after the cessation of the attack.

As regards the occurrence of local changes in the nose, several authors have drawn attention to the fact that mucous polypi sometimes develop in hay fever patients, as also in those suffering from certain allied nasal neuroses, as a sequela of repeated attacks.

In certain instances patients who have been free from ordinary bronchial asthma, occurring apart from the hay fever period, begin to give evidence of the affection, and may even continue to suffer from it after the tendency to hay fever has disappeared with advancing age.

There appears to be little or no tendency for emphysema to develop in connection with hay asthma, although in sporadic instances the former condition may be observed. Some observations made by Gönner, a Swiss observer, appear nevertheless to indicate that in Switzerland, at any rate, the occurrence of emphysema as a sequel of the periodic attacks of asthma is by no means uncommon.²

¹ See (*Nouveau Dictionnaire de Médecine, etc.*, Paris, 1865, vol. iii. p. 583 *et seq.*) has reported the occurrence of cardiac complications.

² Gönner, *Corr.-Bl. f. Schweiz. Aerzte*, No. 8, 1897.

TREATMENT

The writer proposes to discuss the subject of treatment under three main headings as follows:—(1) Prophylactic methods; (2) methods of treatment during the attack; and (3) methods designed to prevent or lessen the severity of the attack. Finally, some general points connected with the management of hay fever cases will be briefly considered.

1. PROPHYLACTIC METHODS

Climatic Treatment.—This is undoubtedly the most important of the methods coming in the category of prophylactic measures, and consists in the removal of the patient to some region from which the active varieties of pollen are temporarily or permanently absent, or are only present to a very small extent. The most secure method of attaining this object is to undertake a sea voyage, and for certain severe cases this plan is the only one by which relief can be obtained. Although obviously not in any sense a cure, it nevertheless obviates the miserable discomfort of the attack and the debilitating after-effects, and moreover, if practised annually, it also prevents the aggravation of the malady which is otherwise liable to take place with each recurrence.

A good plan, where it is feasible, is to take a cruise in a yacht or other vessel during the whole of the hay fever period, either spending the time in the Mediterranean or taking a trip to Norway (see p. 60). A voyage of a few days, on one of the Transatlantic Liners for example, would in most cases be of little avail, as the symptoms would be likely to return as soon as the patient reached the port of destination.

That the method possesses certain disadvantages in the shape of expense, inconvenience, and so on, will be apparent, and for the great majority of patients a cruise on the sea for the whole of the critical period is practically impossible. It remains therefore to consider whether there is any alternative course between that of taking refuge on the ocean, or remaining on the pollen-ridden land. Such an alternative may fortunately be found, in many instances, by carefully selecting a

place on the sea-coast, where cases of even the most severe type may sometimes remain wholly or in great measure free from the symptoms until the critical period is past and gone. Nevertheless it is not sufficient merely to recommend a patient to betake himself to the seaside in order to avoid hay fever, especially if the malady is present in a severe form; and if this advice be given without qualification it is quite probable that little or no benefit will be found to result. The careful selection of the locality, with reference to such points as the direction of the prevailing winds, the amount and character of the neighbouring vegetation, and so on, must therefore be insisted upon. Thus, for example, a deeply indented, more or less landlocked bay would generally be unsuitable, especially if the ordinary hay-grasses were prevalent in the district, or if the prevailing winds were from the land side. On the other hand, a sojourn in a place located on or near the end of a peninsula, or one situated where the vegetation is sparse and the prevailing winds are from the sea, would offer the patient a better chance of escaping the attack. Also, a spot protected from the land-breezes by high cliffs would often prove equally suitable.

Among the coast places in the British Isles which fulfil, to a greater or less extent, the conditions necessary to secure immunity from pollen, there may be mentioned the coast in the neighbourhood of St. David's Head, in Wales, Lundy Island,¹ Lizard Point, and some parts of the Isle of Man. Certain islands on the west coast of Scotland may also prove suitable resorts, at any rate for a part of the hay fever season, on account of the comparative lateness of the grass-flowering period. In the Isle of Skye, for instance, patients have sometimes remained free from hay fever until about the middle of July owing to this circumstance.

In occasional instances, however, it is found that almost any change of habitat proves of advantage to the patient, even a transition from town to country or from country to town, or a change of residence from one town to another. Residence

¹ This island, which has obtained some repute as a refuge for the victims of hay fever, is situated in the mouth of the Bristol Channel, and measures $3\frac{1}{2}$ miles by 1, attaining an altitude of 525 feet.

in a mountainous district has an excellent effect in some cases owing, in great measure, to the fact that vegetation is more sparse in these districts than in the plains.

In addition to the places in Great Britain which have been mentioned, there are certain islands in the North Sea where the vegetation which produces the offending varieties of pollen is more or less scanty, and where such pollen as is generated can, by a judicious selection of habitat, be to a large extent avoided. Nevertheless it may be impossible to avoid the irritant entirely, and such places are therefore more especially indicated for cases of moderate severity, where a high degree of susceptibility to the action of pollen does not exist.

Of the islands in question, Heligoland¹ has acquired the greatest reputation; but its importance as a refuge for hay fever patients has undoubtedly been exaggerated, and the resort has been the subject of various illusory statements—as for example that it is destitute of grasses and that it offers a sure and certain prospect of immunity to the afflicted individual. As a matter of fact it is quite possible for a patient to develop hay fever while residing in Heligoland, especially if the susceptibility to pollen be very pronounced, although in most instances the attack will be of a less severe character than usual. With regard to the presence of grasses, it may be said that vegetation of this character is, in general, sparse, and is confined to the uplands, and patients who select an abode near the seashore are for all practical purposes safe, except when a land-breeze is blowing. Schultz considers that patients should never select the attractive elevated district known as the "Nice of Heligoland," where various forms of vegetation abound, but should keep as close to the shore as possible—in fact, "the nearer the landing-stage the better."²

Nevertheless, so long as pollen is being produced, the places

¹ Heligoland, a small island belonging to Germany, is situated in the North Sea, 36 miles N.W. of the mouth of the Elbe. It measures about 1 mile by $\frac{1}{2}$ mile, and consists of the *Oberland*, a rock 206 ft. in height on which a small town is situated, and the *Unterland*, comprising a stretch of shore with a few houses.

² Schultz (Otto), *Münch. med. Woch.*, No. 30, 1909.

referred to provide only a relatively favourable chance of obtaining immunity. There remains another and more reliable method of securing the desired object, which may be practised if the patient possesses the time and the means to adopt it. The method consists in removing from the neighbourhood of pollen altogether, not by engaging in a prolonged cruise but by resorting to some spot on the Continent where, owing either to the altitude of the locality or to its southern latitude, the flowering time of the grasses (and consequently the incidence of hay fever) occurs at a considerably later or earlier date than is the case in England. There are, for example, numerous places in Italy where hay fever is over before the English period has commenced ; or, to take one of the northern countries, it is found that in certain parts of Norway the grasses do not begin to flower until the end of July or the beginning of August, and the incidence of hay fever is proportionately delayed.

It may be of interest to such hay fever patients as are able to take advantage of the temporary immunity supplied by places of this description, to mention certain localities which have been found to fulfil the desired conditions, and to indicate the time of year at which they may generally be visited.¹

Certain Places in which the Grass-flowering Period is, in General, later than in England.—*Norway and Sweden.*—A sojourn on the Norwegian coast possesses the advantage that it can in some instances be arranged with a cruise on the open sea, the latter being undertaken about the end of June, when the grass-flowering period generally commences. North of Trondhjem,² the flowering time of the grasses and cereals is delayed until about the end of July or the beginning of August. In Stockholm hay fever usually appears towards the end of June.

¹ As the following data are in most cases obtained from the statements of patients whose individual experience has been of the character described, the suitability of the various places at the periods mentioned may not prove universally applicable, as patients often differ both in their susceptibility to the action of pollen and as to the time of incidence of the malady.

² Trondhjem is 250 miles N. of Christiania by rail.

Switzerland.—St. Moritz, Arosa (Canton of Grisons), and Andermatt (Canton of Uri) are among the places which have been found suitable for a certain part of the critical period. Patients visiting St. Moritz (6033 ft.) usually remain free until the middle or latter part of June. Arosa (about 6000 ft.) has been found suitable until about the beginning of July;¹ Andermatt (4738 ft.) until the latter part of June; but the weather is rather too cold for some patients in that month. As regards Zermatt (5315 ft.), it is said to be free from grass-pollen only until the middle of June;² hay fever has indeed been observed at an even earlier date. Patients can escape, however, by changing their quarters to the Riffelalp or Riffelberg, three and four hours respectively above Zermatt.

France.—Certain places situated at high altitudes (Vorges-en, Mont-Dore les Bains, etc.) have been recommended. Cartaz considers that such places as Mont-Dore and Bourboule are especially suitable for hay fever patients, inasmuch as the latter obtain there the climatic advantages and also those of the mineral springs. (For places in the South of France, see under N. Italy.)

Certain Places in which the Critical Period is usually over before that in England has Commenced.—*North Italy*.—The Italian Riviera is stated to be suitable from the early part of June onwards. Genoa is a little later—about the middle of June.³ The French Riviera is also suitable generally from about the middle of June, but both Nice and Cannes are said to be unsuitable for hay fever patients on account of the prevalent dust.⁴ Milan and other inland resorts are better avoided during May and June.

Central Italy.—Rome, Florence, and other inland places are, in general, not to be recommended.

¹ *Bericht viii. des Heufieberbundes*, 1906, p. 55. The writer desires to express his indebtedness to Herr Otto Schultz, of Hanover, who kindly forwarded a number of the Annual Reports of the German "Hay Fever Union," from which most of the information concerning the temporarily immune places has been obtained.

² *Ber. xi. des Heufieb.*, 1909, p. 14.

³ *Ber. vi. des Heufieb.*, 1904.

⁴ *Ber. vi. des Heufieb.*, 1904, p. 89.

Southern Italy and Sicily.—Naples and Capri are suitable from the end of May or thereabouts. The temperature in Naples is rather too high during the hot season (middle of June to the end of August) for most British patients, but the remaining period, until the end of the usual hay fever season in England, may be spent either at Capri or at one of the summer resorts in the neighbourhood of Naples, such as Castellamare or Sorrento.

In *Sicily* (Palermo, Messina) hay fever usually ceases to appear about the latter part of April, but the same remark as to the heat which occurs in the succeeding months applies also in this instance.

In Algiers and other places on the coast of *N. Africa* hay fever is unlikely to occur after the middle or latter part of April.¹ The Canary Islands are also suitable, as a rule, from May onwards. In Madeira mild symptoms of hay fever have been observed as late as June, due apparently to certain cereals being in flower.²

There are, of course, numerous other resorts which have been found suitable by hay fever patients, and those which have been mentioned merely represent a selection of the places which offer an immunity at or about the English hay fever period.

The subject of **surgical prophylaxis**, which includes the rectification of intra-nasal lesions, the application of the galvano-cautery and other measures, is discussed below, in connection with surgical measures in general (p. 75). Treatment of this character is only prophylactic in those cases in which the local condition in the nasal cavities is the essential predisposing cause.

Medicinal Treatment.—A number of drugs have been recommended as having a tendency to reduce the severity of the attack, if administered before the critical period commences, or, especially if combined with other measures, to prevent its occurrence. Among the remedies which are likely to prove useful in this respect are quinine, phosphide or valerianate of

¹ *Ber. vii. des Heufieb.*, 1905.

² *Ber. iii. des Heufieb.*, 1901, p. 15.

zinc, arsenic, nux vomica and belladonna. A suitable formula is valerianate of zinc (1 grain), with compound asafoetida pill (2 grains), given three times a day. As an alternative, phosphide of zinc ($\frac{1}{16}$ grain), sulphate of quinine (2 grains), and extract of nux vomica ($\frac{1}{2}$ grain) may be given thrice daily before food. Some authors recommend, in addition to this, 3 to 5 minims of Fowler's solution to be given three times daily after food. Whatever medicinal agents are selected, the administration of the remedies should be begun several weeks before the expected date of the attack.

Prophylaxis by Immunisation and Similar Methods.—Holbrook Curtis reports that he has obtained favourable results by the hypodermic injection of weak extracts of plants ("ragweed," golden rod, roses, etc.), the pollen of which is found to be liable to set up the manifestations of hay fever.¹ Wagner,² Ingals,³ and others have also employed various plant extracts with the same object and have obtained good results.

Scheppegrell has recently introduced a method, designed to render the patient immune, by inhaling the pollen from the staminate flowers of "ragweed" which have been collected in the previous season. The inhalation is carried out several times a day, and each application causes some sneezing, rhinorrhœa and lachrymation; the treatment is continued for from four to six weeks before the usual onset of the annual attack.⁴

The administration of thyroid extract or of antithyroidin⁵ has been recommended by Heymann⁶ and Pottier.⁷ The former observer seems to have been induced to make a trial of thyroid extract in consequence of having observed that a patient, who had been a sufferer from hay fever, remained entirely free from the malady after a thyroidectomy had been performed. The

¹ Holbrook Curtis, *New York Med. News*, July 7, 1900; *New York Med. Rec.*, July 13, 1901; *New York Med. Journ.*, March 8, 1902.

² *New York Med. Journ.*, March 8, 1902.

³ *New York Med. News*, September 13, 1902.

⁴ Scheppegrell, *New York Med. Journ.*, December 4, 1909.

⁵ Serum from a thyroidectomised sheep.

⁶ *Archiv. Internat. de Laryngol.*, May-June 1907; *Internat. Centralbl. für Laryngol., etc.*, 1908, p. 49.

⁷ *New York Med. Journ.*, July 27, 1907.

substance was administered in nineteen cases, with results which are stated to have been very favourable in every case. The longer the period of administration previous to the usual onset of the hay fever attack, the better, generally speaking, were the effects ; but in only three instances was there an entire absence of the symptoms. The dose administered was 5 to 15 grains daily, and no toxic symptoms were observed in any of the cases. It would appear from Heymann's observations, and also from those of Pottier, that the substance requires to be administered for some considerable time before the expected onset of the attack, and although healthy individuals usually display a marked tolerance for the drug, it is evident, in view of the serious by-effects which may occur, that the patient should be under strict supervision if this method of treatment be adopted.

2. METHODS OF TREATMENT DURING THE ATTACK

In connection with this subject we may consider, first, the purely symptomatic or palliative treatment, and, secondly, treatment designed to cut short the attack or to effect its reduction to a minimum.

(a) **Symptomatic or Palliative Treatment.**—The writers whose works appeared before the enthusiasm for **cocaine** had been tempered by a recognition of its deleterious effects, regarded the introduction of the drug as a vast benefit both to those who suffered from hay fever and those who were called upon to do something for its relief ; and indeed the attitude of these authors is, under the circumstances, quite intelligible. It is now, of course, recognised that although cocaine may give considerable relief, the local effect is not only transitory, but, owing to the paretic condition of the vessels which follows, is ultimately harmful, and the nasal obstruction and other symptoms become more troublesome than before. Moreover, it is usually found that the dose requires to be increased, and the indiscriminate use of the drug not only lays the patient open to the danger of acquiring the cocaine habit, but the local effects on the mucosa are such, that the prognosis as regards cure becomes of the most unfavourable character.

As substitutes for cocaine, adrenalin, or various combinations of this remedy with other drugs, may be employed. Adrenalin proves in most instances a remedy of considerable value, and may, if necessary, be administered both internally and externally. Owing to its being rapidly destroyed in the blood the effects are somewhat transient, but apart from this drawback the drug appears to possess no disadvantages, and the author has been unable, after a careful search, to find any reference to the occurrence of toxic effects.¹

A spray containing a 1 in 4000 solution is usually sufficient for the nasal cavity, but stronger solutions, up to 1 in 1000, may be required, and the application may need to be repeated several times in the twenty-four hours. For the eyes, a solution of 1 in 10,000 may be used. Although a spray is preferred by many patients, the remedy may also be applied on a pledget of cotton-wool inserted into the nose, or in the form of a powder or an ointment. The latter, if made up in a collapsible tube, possesses the advantage of being more convenient to carry about and to apply than a spray.²

In order to obtain the maximum advantage from adrenalin the drug should be applied not when the nose is blocked, but before this condition has occurred; the manner of using the solution is, in fact, similar to that recommended for pollantin (p. 67).

If the local administration of adrenalin does not produce sufficiently good effects, the internal administration of the substance may be tried. Or the methods may be combined, and some observers have reported very good results from the

¹ Toxic effects have, however, been observed in a few cases in which the suprarenal extract was employed. The drug is said to be ineffective when arterio-sclerosis is present.

² Messrs. Squire & Sons have introduced a convenient preparation of this description under the name of "*Corisol*." It consists of adrenalin prepared with a soft mineralised base. A small quantity of the ointment is squeezed through the nozzle of the collapsible tube, in which it is contained, into each nostril alternately, and the substance is then thoroughly sniffed up.

It is to be noted, in connection with adrenalin, that the drug should not be exposed to light or heat, and that when it is desired to dilute the solution normal saline solution should be used as the diluent.

adoption of this procedure. Eight minims of adrenalin chloride solution (1 in 1000) should be administered, at first twice daily, later on the remedy may be given less frequently, but its administration should be continued until the hay fever period is over.

Various combinations of adrenalin with other drugs have been suggested. Good results have been obtained by Avellis with a mixture composed of **adrenalin**, **anæsthesin** and **subcutin**. The remedy can be applied either as a powder, a spray, or in the form of a cream. Spira recommends a mixture of **chlorethane** (30 parts), **adrenalin** chloride (1 part), with neutral **liquid paraffin** (1000 parts) for the uncomfortable blocking of the nose which accompanies the earlier stages of ordinary acute rhinitis, and the present writer has found that the remedy, when instilled into the nose, affords considerable relief to the nasal obstruction which is so troublesome a feature in many cases of hay fever.¹

Adrenalin may also be used with **eucaine**² or with **stovaine**. The latter substance possesses only about half the toxicity of cocaine, but, unlike this drug, it is a vaso-dilator; the addition of the adrenalin obviates this to a considerable extent.³

Among other local remedies which are stated to have good effects are **orthoform**,⁴ the application of **carbonic acid gas**,⁵ which acts as an anæsthetic, an antiseptic and a vaso-constrictor on the nasal mucosa, and the local employment of **quinine**. Fulton⁶ recommends the latter as an ointment made with vaseline (30 grs. to 1 oz.), and preceded by a saturated solution of sulphate of quinine. The applications require to be made several times in the twenty-four hours.

¹ Messrs. Parke, Davis & Co. have a very similar preparation ("adrenalin inhalant") which is supplied in bottles containing 1 oz.

² For intra-nasal application a 4 or 5 per cent. solution of eucaine in 1 in 4000 adrenalin may be used. For the eyes the following formula may be adopted:—Eucaine (8½ grs.), adrenalin (½ gr.), distilled water to 1 oz. This represents 2 per cent. of eucaine in a 1 in 10,000 solution of adrenalin.

³ A suitable formula is stovaine (22 grs.), adrenalin (½ gr.), chloride of sodium (3½ grs.), chlorethane (1 gr.), distilled water to 1 oz.

⁴ Lichtwitz, *Bulletin Méd.*, January 23, 1898.

⁵ Joal, *Rev. Heb. de Laryngol.*, etc., May 12, 1900. Rose, *New York Med. Journ.*, November 11, 1905.

⁶ *Journ. of the Amer. Med. Assoc.*, July 30, 1904.

Pollantin.—This substance, to which reference has already been made (pp. 37, 39), is supplied in a liquid form and also as a powder. Liquid pollantin contains a small quantity of carbolic acid ($\frac{1}{4}$ per cent.) for its preservation; the powder consists of desiccated serum made up with milk sugar.¹ Probably in most instances the powder acts with greater efficacy, but many patients prefer the liquid pollantin as being more convenient, and, in any case, it is the more suitable application for the eyes.

As the success of the treatment depends mainly on the strict compliance with the directions which are supplied with pollantin, it is important that these be carefully read and attended to. It is not necessary to give these directions in detail here, but there are, nevertheless, a few points to which reference may be made. In the first place, it is to be noted that the prophylactic employment of pollantin is of importance; that is to say, the remedy should not only be applied before the commencement of the diurnal attacks, but should also be employed before the malady has made its appearance at all. In an average year the patient can form an approximate idea of the probable time of onset of the symptoms, and therefore for eight or ten days before this date the serum should be introduced into the eyes and the nasal cavity twice daily. When the symptoms have begun to develop, pollantin should be regularly introduced beneath the lower eyelids and into the nasal passages before rising each morning, and afterwards at the first suspicion of any returning irritation. If the application be delayed until the nasal passages have become blocked, the proper distribution of the solution on the mucous membrane will not be effected. After the first application in the morning it is a good plan for the patient to rest quietly for from ten to fifteen minutes. This matutinal treatment, if properly carried out, may render the patient immune for several hours, and in some instances for the remainder of the day.

¹ Lübbert and Prausnitz (*Berl. klin. Woch.*, Nos. 11 and 12, 1904) advise that a bottle containing serum should not be employed for longer than a week, at the limit, as after that period decomposition begins to occur. It is also to be noted that the remedy is purely for local application, and should never be injected subcutaneously.

Finally, it is to be noted that the employment of pollantin does not necessarily make other remedial measures superfluous, nor does it render the patient independent of such precautionary measures against the admission of pollen as are described below (p. 84).

In some instances, even when properly applied, pollantin proves an entire failure, or may even set up so much irritation that its use has to be abandoned. In such cases, if the substitution of the powder for the liquid serum produces no better results, the serum known as **graminol** may be tried. In still other instances the action of pollantin, although very satisfactory at first, diminishes with each successive season, until finally nothing but irritation is produced. Lübbert and Prausnitz have pointed out that when there is an idiosyncrasy against phenol, the liquid serum (which, as already stated, contains a small amount of this agent) has little or no effect on the malady, and the powder should then be substituted. Apart from cases of this character, idiosyncrasy against pollantin (probably referable to the horse serum) has occasionally been observed.¹

Graminol (p. 39), a serum manufactured by Messrs. Ruete & Enoch, of Hamburg, has been recommended by Weichardt and others as being more effective than pollantin. Weichardt, who first introduced the remedy, states that the "German Hay Fever Union" obtained favourable results in 75 per cent. of the cases tested, while in 38 per cent. there was complete relief.² Wolff-Eisner³ has also obtained good results with graminol, and, on the whole, prefers it to pollantin, although in certain instances the latter serum is the more effective. Comparing Weichardt's statistics concerning graminol with those of Zarniko, collected in Europe and America, with regard to pollantin, the latter are found to indicate that in 61 per cent. good results were obtained with this agent, in 23 per cent.

¹ Zarniko (Carl), *Berl. klin. Woch.*, September 10, 1906. See also a case reported in the *Lancet* (1905, vol. ii. p. 130), in which untoward symptoms—giddiness, tinnitus, vertigo and vomiting—followed its employment.

² *Berl. klin. Woch.*, No. 36, 1906.

³ "Das Heufieber," p. 71.

fair results, and in 15 per cent. no results. These figures, contrasted with Weichardt's, lead to an impression somewhat in favour of graminol, but further observations would be necessary before any final conclusions could be drawn as to the relative value of the two sera.

In addition to local treatment, various forms of **general treatment** by drugs and other measures have been recommended. Valerianate of zinc, and the other remedies mentioned at page 62 as having a prophylactic effect, will also in many cases prove of value if administered during the course of the malady. Ball recommends a pill containing quinine ($1\frac{1}{2}$ grs.), iodide of arsenic ($\frac{1}{24}$ gr.), and extract of belladonna ($\frac{1}{12}$ gr.), to be administered three times a day.

Opium and its derivatives have also been advocated as tending to reduce sneezing and nasal hypersecretion, and also for their effect on the nervous system. Morell Mackenzie recommended the exhibition of tincture of opium in doses of five to seven drops twice daily, a saline purgative being taken on alternate mornings. Similar objections would, of course, apply to the routine administration of opium or morphia in hay fever as obtain in regard to cocaine.

Treatment of the Eye Symptoms.—Bathing the eyes with warm water (104° - 113° F.) may be productive of relief, and for the immediate assuagement of the irritation, a solution of adrenalin chloride (1 in 10,000) containing 2 per cent. of eucaine may be employed;¹ or the adrenalin may be used alone, the application being repeated when symptoms of congestion and irritation recur. Instead of eucaine, a solution of holocaine (1 per cent.) may be instilled into the conjunctival sac. This drug generally causes a slight burning sensation, which, however, rapidly passes off; it possesses, among other advantages, that of not causing midriasis, or of affecting accommodation. With regard to astringent lotions, none but those of a mild character should, of course, be selected. A lotion recommended by Morell Mackenzie, containing acetate of lead (2 grs.), dilute acetic acid (2 m), with water to one ounce, has proved useful in a number of cases, and the eyes may be bathed with this solution three or four times daily. In many cases

¹ See the formula given in footnote ² p. 66.

pollantin, if properly applied, proves more useful than any other local application for the relief of the irritation.

Both strong light (especially if the patient shows a tendency to photophobia) and dust are liable to intensify greatly the discomfort which is experienced. To avoid the former the patient should refrain, whenever possible, from going out of doors when there is much glare, as, for example, at midday; or if obliged to leave the house at such times, blue-tinted or smoked spectacles (preferably the latter) may be worn. The spectacles should be specially constructed with large frames, so as to fit as accurately as possible to the margin of the orbit, and attached to the circumference of the spectacle frame there should also be a protecting rim of gauze, so as to offer a further obstacle to the direct contact of pollen or other irritants. Ordinary motor goggles have been recommended, but these are hardly dust-proof in the strict sense, as a certain amount of air is admitted.¹ If suitable spectacles are not at hand, the device of wearing a hat with a good broad brim may be tried.

Treatment of the Asthmatic Symptoms.—The management of the bronchial manifestations is conducted on similar lines to those followed in ordinary asthma, but there are a few special points in connection with hay asthma to which reference may be made.

With regard to the prevention of the asthmatic symptoms, Lübbert considers that the prophylactic employment of pollantin, in the manner described at page 67, not unfrequently results in the non-occurrence of the asthmatic attacks, or at any rate renders the paroxysms less severe in character.²

As in the case of ordinary asthma, the administration of iodides may be found of value; and in those instances in which the tendency to asthma forms the chief symptom, without, it may be, definite severe attacks, the exhibition of the drug,

¹ Judging from Blackley's experiments and from other observations, it would appear that the irritation in the eyes is to a very large extent, although not entirely, reflex in character, due to irritation in the nasal cavity. To obtain the maximum amount of comfort, therefore, some form of nasal "filter" or "respirator" should be worn, as well as the spectacles (see p. 84).

² *Therap. Monats.*, December 1904.

combined with arsenic, may hold the bronchial manifestations in check. The burning of nitre papers may also give relief, but it is important that these be sufficiently strong, and that the patient's room be made quite thick with the smoke. A good plan is to take six thicknesses of a porous material, such as blotting-paper, and to steep these in a saturated solution of potassium nitrate and potassium chlorate. The paper is then allowed to dry and can afterwards be cut into strips.¹

There are certain points in connection with the use of coffee and tobacco which may also be mentioned. Strong coffee is often extremely useful in the asthmatic form of hay fever, both for the paroxysm itself and for counteracting the exhaustion which is apt to succeed the attack, and in the great majority of cases is much preferable to alcohol for the latter purpose. When administered with the object of relieving the spasm, coffee should never be taken with a meal, but should be reserved for use at the onset of the paroxysm; it is of especial importance that the remedy when given for this purpose should be hot, black, and very strong.

Tobacco sometimes has a good effect on the spasm, especially if the patient is not a habitual smoker; but it may, on the other hand, prove highly disagreeable and even aggravate the symptoms, and is hardly to be recommended for this class of patient. But for those who are accustomed to tobacco the smoking of a good cigar the last thing at night, when the patient is in bed, may prove sufficiently sedative to secure a good night's rest.

In hay asthma it is advisable to avoid a too generous diet, and the food taken should be of a character which is easily digested. Blackley recommends that such patients should not take animal food more than once daily, and never in the evening.

As a local remedy, sprays of adrenalin chloride solution

¹ Nitrate of potash may also be combined with stramonium and other agents as follows:—Stramonium leaves, *Datura tatula*, *Cannabis indica*, and *Lobelia inflata*, all in powder, of each 6 drachms; Nitre, in powder, 1 oz.; Eucalyptus oil, 30 minims. Mix thoroughly. (*Squire's Companion to the Brit. Phar.*, 18th ed., London, 1908). This mixture, when burnt, produces dense fumes, and in some cases gives marked relief.

(1 in 4000 to 1 in 1000) may be given, or this drug may be injected subcutaneously.¹ For those cases in which the patient suffers from loss of sleep owing to asthma and cough, the administration of codeia has been found of value.

Lastly, the injection of diphtheria antitoxin has in a number of instances produced a striking effect, both on the manifestations of hay asthma and on those associated with the oculonasal form of the malady.²

For the relief of the disagreeable **itching of the face**, the palatal region and other parts, which may be present, various remedies have been suggested. For the cutaneous irritation Ringer and Murrell recommend the application of aconite liniment, or an ointment made with same agent.³ Excoriations or abrasions on the upper lip, or elsewhere on the face, may be treated with an ointment containing oxide of zinc or some similar bland substance. Irritation about the nostrils may be relieved by bathing the parts with spirits of camphor mixed with warm water. The itching in the palate may sometimes be relieved by insufflating powdered pollantin on the part or by applying the substance with the finger.

The prostration which may accompany hay fever has already been referred to, and, apart from the indications mentioned, should be treated on general lines.

(b) **Methods Devised for the Purpose of Cutting Short the Attack.**—For cases in which erectile swelling and vascular injection of the nasal mucosa constitute the only abnormality, Watson Williams recommends the application of a solution of biniodide of mercury to the lining membrane.⁴ The nasal passages are first sprayed with a solution of cocaine, and the biniodide (1 in 10 to 1 in 20) is afterwards applied, also by means of a spray. As the biniodide rapidly destroys the

¹ Melland (B.), *Lancet*, May 21, 1910.

² Also in ordinary bronchial asthma. See *Brit. Med. Journ.*, 1908, vol. ii. p. 1853; *ibid.*, 1909, vol. ii. pp. 300, 356, 1016.

³ A suitable ointment is the unguentum aconitinae (B.P.). This preparation, as also the liniment of aconite, should be guarded from contact with the eye, and neither preparation should be applied to an abraded surface.

⁴ Williams (Watson), "Rhinology," London, 1910, p. 161.

cocaine, a hypodermic injection of morphia should immediately be given, otherwise considerable pain will be experienced. As a result of the nasal application the mucous membrane becomes much congested and swollen, and these symptoms are succeeded by signs of a nasal catarrh, which lasts for two or three days. If this plan of treatment be adopted it should be carried out at the first indications of the onset of the malady.

Massage of the nasal mucous membrane has been recommended as a method of shortening or reducing the severity of the attack by Denker,¹ Urbantschitsch,² and others. The method can be used as a prophylactic measure before the hay fever period commences, but it is more usual to practise it during the actual attack. Its employment at this period, however, needs some caution, on account of the sensitiveness of the nasal mucous membrane. The accessible regions of the nasal cavity are first thoroughly anæsthetised with a solution of cocaine and adrenalin applied on a probe dressed with cotton-wool, this being preceded in most cases by the application of cocaine in the form of a spray. The massage is effected by means of a nasal probe similarly covered with wool and smeared with liquid vaseline or with an ointment of europhen (10 per cent.) made up with the latter substance. Rapid vibratory movements are communicated to the probe, which is applied to the inferior turbinate, the septum and other accessible parts. The procedure is carried out three or four times a week, and for two or three minutes at each sitting. Beneficial effects are in many cases obtained, not only in regard to the current attack, but also in relation to attacks in succeeding years, which are milder or may indeed fail to appear.

Mahu and Lermoyez,³ as also other observers, have obtained good results with the intra-nasal application of superheated air. The heat is obtained from a special electrical apparatus, and the effect of the hot air on the nasal mucous membrane appears to be that of a mild caustic. The author has not had

¹ *Münch. med. Woch.*, No. 19, 1905.

² *Ibid.*, No. 22, 1905.

³ Lermoyez, *Annales des Mal. de l'Oreille, etc.*, 1899, xxv. Mahu, *ibid.*, 1902, xviii. Lermoyez and Mahu, *ibid.*, 1901.

an opportunity of personally observing the effects of this method, but it would appear, from the reports which have been published, that while some rhinologists have obtained favourable results, others have not been so fortunate.

A method which aims at abolishing the sensitiveness of the mucous membrane by injections of alcohol into the nasal nerves has been suggested and practised by Otto J. Stein of Chicago.¹ The sensory nerves of the nasal cavity being chiefly derived from the nasal branch of the first division of the fifth, anteriorly, and from the sphenopalatine ganglion posteriorly, and these nerves being, moreover, accessible at certain determinate points, Stein has found it possible to inject alcohol, by means of special needles, into or near the structures, and to effect such a diminution in sensitiveness that the nerves no longer become excited by the accustomed irritant.

I have had no personal experience of this method, but its introducer has obtained favourable results in a number of cases, although he admits that it is impossible, as yet, to form any idea as to the period of freedom from symptoms which the patients are likely to enjoy, or to feel assured that a recrudescence will not take place when the nerves recover their functions. It seems probable that the procedure would, in many instances, offer considerable manipulative difficulties.

A number of authors have reported good results, in the direction of alleviating or shortening the attack, by the cautious application of the galvano-cautery or chemical caustics (see also p. 76). Garel² recommends the application of the cautery even during the height of the attack, partly with the object of causing retraction of the swollen mucous membrane and partly with a view to reducing its sensitiveness. The employment of glacial acetic acid and of chromic acid has also been advocated. Grayson recommends "pin point" applications of the latter agent (after cleansing, anæsthetising and

¹ "The Treatment of Hyperæsthetic Rhinitis (Hay Fever), especially with Reference to Injections of Alcohol," *Chicago Medical Recorder*, July 1908. The reader is referred to this paper for details of the method, which is there fully explained and illustrated.

² *Loc. cit.*

contracting the mucous membrane) as a method which, in certain cases, proves of value in shortening or reducing the severity of the attack.¹ The application of silver nucleide ("Nargol") has been recommended by Price, as preferable to methods which result in the production of scar-tissue, and he advises painting the affected mucous membrane every three days, during the hay fever period, until the sensitiveness disappears.²

Killian advocates painting the nasal mucous membrane, in certain special regions, with trichloracetic acid. The treatment should be carried out before the hay fever period commences, as it is intended to act as a prophylactic measure.³ Four areas, namely, the anterior part of the septum, the anterior end of the middle turbinate, the outer wall of the nose slightly above the anterior end of the middle turbinate, and lastly the upper part of the septum above the tubercle, are painted for a space of about half an inch with trichloracetic acid, care being taken to keep the caustic localised. The method has proved successful in keeping the patient free from symptoms during the ensuing season, but its effects are not usually permanent, and the procedure may subsequently require to be repeated.

3. METHODS DESIGNED TO PREVENT OR LESSEN THE SEVERITY OF THE ATTACK

Surgical Methods.—Under this heading may be included—(1) The correction of intra-nasal abnormalities; (2) the application of the galvano-cautery or chemical caustics; (3) partial or total turbinectomy; (4) resection of the nasal branch of the fifth nerve; and (5) bilateral excision of the tubercle of the nasal septum.

(1) **The Correction of Intra-Nasal Abnormalities.**—It has been mentioned, when discussing the etiology of the disease, that there exists a considerable divergence of opinion,

¹ Grayson (C. P.), "Diseases of the Nose, Throat and Ear," London, 1907.

² *Therapeutic Gazette*, August 15, 1908.

³ *Laryngoscope*, May 1907.

on the one hand as to the relative frequency with which definite intra-nasal abnormalities are present, and, on the other, as to the significance of such lesions, when they are actually in existence, in relation to the pathogenesis of hay fever. It is not possible to predict, in a given case, whether the correction of a local morbid condition in the nose will cure or benefit the neurosis; and inasmuch as the rectification of the lesion may be productive of no benefit whatever, so far as the manifestations of hay fever are concerned, it is a good general rule to recommend measures of this description only when they would be called for on ordinary grounds, as, for example, when the local condition is giving rise to nasal obstruction, or is responsible for the persistence of a chronic catarrh. If the treatment relieves the neurosis as well as the nasal obstruction or other abnormal condition, *tant mieux*. When, also, there is an abnormality which is an obvious or probable source of irritation (such as the contact of a spur or a deviation of the septum with the inferior turbinate), surgical measures for its rectification will, in most instances, be indicated. As to the particular form of treatment to be adopted, when surgical measures are decided upon, the surgeon will, of course, be guided by the nature of the abnormal condition which is present, and for the details of the various procedures which may be required the reader is referred to works dealing with the diseases of the throat and nose.¹

(2) The Application of the Galvano-Cautery or Chemical Caustics.—As mentioned above, certain writers have recommended the application of the **galvano-cautery** during the height of the attack, but in the majority of cases it is preferable to practise this method before the attacks commence, with the object of effecting, beforehand, the reduction in the sensitiveness of the mucous membrane to the special irritant. When employed in this manner it is customary to carry out the treat-

¹ The chief morbid conditions which are likely to require treatment are septal deviations and spurs, hypertrophic conditions of the inferior turbinate, mucous polypi, and adhesions between the septum and inferior turbinate. More rarely, the middle turbinate requires treatment. A description of the various surgical methods will be found in the present writer's "Handbook of the Diseases of the Nose and Throat" (Edinburgh and London : William Green & Sons, 1909), pp. 27-78.

ment in the month of March or April. In some instances one course of treatment is sufficient, but in those cases in which only partial relief is obtained, the procedure may require to be repeated at a similar period in one or more successive years.

There is some difference of opinion among rhinologists as to the exact place on the mucous membrane to which the cautery should be applied, some recommending the inferior turbinal region, others the region of the septum opposite the anterior end of the middle turbinate, and others, again, advocating the strictly superficial application of the cautery to the mucous membrane of the middle turbinate itself.¹ A good general plan is to make one or two linear burns on the anterior part of each inferior turbinate, and to follow this by cauterising the anterior part of the septum, on each side, in a similar manner, commencing at or about the level of the anterior end of the middle turbinate, and bringing the cautery point forwards and slightly downwards for about half an inch. Several applications of this character will usually be required, but only a single burn should be made at a time (whether on the septum or the inferior turbinate), and a week or ten days allowed to elapse between each sitting.²

¹ Some rhinologists claim that definite hyperaesthetic areas are generally to be found in cases of hay fever, and that these should be cauterised (cf. p. 27).

² There are one or two points in connection with the employment of the galvano-cautery in the nasal cavity which may be mentioned. After anaesthetising the parts with a solution of adrenalin (1 in 1000) containing cocaine (10 per cent.), the cautery point, while still cold, is introduced into the nostril, and is brought in contact with the part which it is desired to cauterise. The current is then turned on, and the point is drawn slowly from behind forward, and is removed from the nostril while still at a dull-red heat, in order to prevent it from adhering to the mucous membrane and tearing away a portion of that structure. It is necessary, unless a speculum with solid blades be employed, to be especially careful when withdrawing the cautery from the orifice of the nostril, as otherwise the parts may be touched with the hot point. A small piece of cotton-wool is inserted on the side that has been cauterised, and is removed in the course of a few hours. The patient should be careful in blowing the nose for a few days, as troublesome haemorrhage may result if this be done at all forcibly.

The cautery should not be applied in nasal cavities which are structurally very narrow, or in those in which the inferior turbinate and the septum

Although the galvano-cautery is, generally speaking, the most convenient agent for reducing the sensitiveness of the nasal mucous membrane, similar results may be obtained with **chemical caustics**. Several of these agents have been already referred to, but among the most useful are chromic acid and monochloracetic acid. If chromic acid be used, it should be fused on a probe and applied in a similar manner to the galvano-cautery, after anaesthetising the mucous membrane and carefully drying the parts with absorbent wool. Monochloracetic acid is applied on a nasal probe dressed with cotton-wool.

(3) **Partial or Total Turbinectomy.**—Partial resection of the inferior and middle turbinates has been recommended by Moure and others for certain cases, and the method would generally have the effect of relieving the nasal obstruction which is so troublesome a feature in most instances. The subject of total turbinectomy is referred to more particularly in connection with the treatment of paroxysmal sneezing (p. 117).

(4) **Resection of the Nasal Branch of the Fifth Nerve.**—This method was first suggested and practised by the present writer in 1907, and a preliminary communication appeared in the *Lancet* for June 13, 1908. The operation was devised chiefly for the relief of hay fever, but it has also been practised for severe cases of paroxysmal coryza associated with asthma.

A study of the distribution and functions of the nasal nerve (nasal branch of the fifth) led me to consider it probable that the stimulus for the reflex disturbances of paroxysmal sneezing, and possibly for those of hay fever, was conveyed to the centres by this nerve. The inference, so far as it concerned paroxysmal sneezing, was mainly based on the generally accepted conclusions of Sandmann, and of Wertheimer and Surmont, that the nasal branch of the fifth was the afferent nerve for the normal sneezing reflex.¹ Sandmann termed the branch in question

are in close contiguity owing to some other cause, on account of the risk of the formation of adhesions.

¹ Sandmann, "Athenrefl. von der Nasenschleimh.," Du Bois-Reymonds *Arch. für Phys.*, 1887, p. 483 *et seq.* Wertheimer and Surmont, "Les Voies Centripètes du Réfl. de l'Éternument," *Comptes Rend. de la Soc. de Biol.*,

the "sneezing nerve" (*Niesnerv*), and it seemed not improbable that the stimulus for the exaggeration of the normal reflex — as represented by paroxysmal sneezing — was also conveyed along this branch. The *ex post facto* evidence obtained by resection of the nerve showed, however, that the impulse can be conveyed by other sensory filaments, and that both normal and paroxysmal sneezing readily occur after the nerve has been divided on both sides.

The hypothesis, as applied to hay fever, was chiefly founded on a consideration of the clinical manifestations of the malady, which strongly suggested that a hyperaesthetic condition of the nasal nerve was an important factor in their production. If these clinical manifestations be considered in relation to the distribution of the nerve, it will be found that they closely correspond, as to their localisation, with the areas to which the latter is distributed, and, further, that the symptoms would be explicable on the assumption that they represented the reflex effects of irritation of the nerve. These various considerations induced me to think that the attacks might be obviated, or at any rate greatly relieved, by resecting a portion of the nerve on each side, at the point where it enters the anterior ethmoidal foramen. This was effected by making an incision at the inner edge of the orbit, just above the inner canthus, and carrying it upwards and slightly outwards for about two-thirds of an inch. The nerve having been located, it was pulled out from the foramen, and a quarter of an inch, or more, of the structure removed.

The few patients upon whom I have performed this operation have all been severe instances of the disease, in which the usual recognised methods of treatment had failed to give any appreciable relief. With regard to the results, it must be admitted that although at first these were very encouraging, an extended experience has shown that in some instances the immunity from symptoms is not lasting, whilst in others only partial relief is afforded in the first instance. In two cases the operation produced no relief whatever. Three or four patients,

1888, p. 62. The portion of the nasal nerve, from the anterior ethmoidal foramen to its periphery, is often termed the *anterior ethmoidal nerve*, and it is under this name that Sandmann and others refer to it.

however, are still under observation, including an instance of paroxysmal coryza with asthma, in which the patient has remained free from symptoms for a year; also a severe case of hay fever in which the attack, during the two summers succeeding the operation, has been represented by mild symptoms lasting twelve and seven days respectively, as opposed to a former duration of six weeks.

My friend Mr. Walter Woollcombe, Surgeon to the South Devon and East Cornwall Hospital, Plymouth, has been kind enough to send me the notes of a very severe case of hay fever and asthma, in which he performed the operation in the spring of 1909. The patient subsequently experienced marked relief both to the hay fever and the asthma, but was not entirely cured. In previous years the attacks had been so severe that he had been unable to follow his profession for three months in the summer, and no treatment had been of any avail.

A case has also been recorded in the Annual Report of the German Hay Fever Union for 1910. The patient, who had suffered from the malady in a very severe form, with asthma, was operated upon at the beginning of May 1909. During the ensuing hay fever season immense relief was experienced, and, as the patient expressed it, fully four-fifths of the discomfort, from which he usually suffered, was absent. The attack, indeed, was mainly represented by a slight nasal catarrh, and, on one occasion only, by slight transient dyspnoea.

(5) **Bilateral Excision of the Tubercls> of the Nasal Septum** (Plate II).—This procedure is described at page 117, in connection with the treatment of paroxysmal sneezing. The operation has been performed in a limited number of cases of hay fever, but the results are too recent to allow of any definite conclusions being drawn as to its ultimate value as a method of treatment for this affection.

Other Methods of Treatment.—Of the innumerable methods, other than surgical, which have been suggested for the cure or alleviation of hay fever, space will only permit of reference to a few.

Several observers, holding the opinion that excess of uric acid in the blood (p. 24) is the fundamental cause of the malady, have reported good results by treatment directed to



PLATE II.—EXCISION OF THE SEPTAL TUBERCLE
IN THE AUTHOR'S OPERATION FOR PAROXYSMAL
SNEEZING AND HAY FEVER.

this condition. Bishop endeavours to reduce the alkalinity of the blood by means of mineral acids, given two or three times daily during the attack. This is preceded for forty days before the expected date of onset by the administration of salicylate and phosphate of soda, for their solvent action on uric acid and the help thus afforded in eliminating that substance.¹ Bishop also advises a diet of vegetables and fruit, with milk, butter, etc. He does not contend that excess of uric acid is the only cause of hay fever, and considers that nasal treatment is required in some cases. Bence Jones recommends citric acid in the form of lemon juice, as having a similar effect to that of the mineral acids. Lowman has obtained good results with a vegetable diet and the administration of lithium salts.² Lockard³ and Gleason⁴ recommend the use of small doses of concentrated nitro-hydrochloric acid,⁵ given one to two hours after meals, as a method which in some cases is successful in keeping the symptoms in abeyance, if carried out during the hay fever period. The treatment is not suitable for all cases, as it causes diarrhoea in some instances.

Fink,⁶ who bases his method on the theory mentioned at page 28, that the mucous lining of the accessory sinuses (especially that of the antrum) is the chief seat of trouble, treats his hay fever cases by insufflating aristol or other substances through the normal ostium of the sinus. Good results have been obtained by Fink with the employment of this method, and the observer is to be congratulated on being able to gain access to the antrum through its normal opening with such apparent facility, as the procedure is usually regarded as one which is apt to present considerable difficulties.

Thost advises, when a disposition to hay fever is combined

¹ *Philadelph. Med. News*, February 24, 1894.

² *New England Med. Monthly*, June 1902.

³ *Boston Med. and Surg. Journ.*, January 15, 1903.

⁴ *Medical Progress*, July 1905.

⁵ *United States Pharmacopœia*. The undiluted acid is not in the *British Pharmacopœia*.

⁶ *Deutsche med. Woch.*, No. 46, 1901. *Ibid.*, No. 49, 1903. *New York Med. Journ.*, November 3, 1906.

with gout, circulatory disturbances, or a catarrhal tendency, that the patient should undergo a "cure" at some suitable health resort before the hay fever period commences.

Among other remedies which have been stated to produce good results in hay fever, the atropine-strichnine method, introduced by Lermoyez for paroxysmal rhinorrhœa (p. 129), may be mentioned. The method has been employed in hay fever by Zegers and others, and the former reports that he administered the remedy in forty-two cases, of which 61 per cent. obtained complete and lasting benefit.¹ Repeated small doses of calomel are stated by Klein² to have given good results in fifty cases of hay fever. **Euphorbia pilulifera, grindelia robusta**, aspirin and bromides have all been mentioned, in various communications, as useful palliative agents. Electricity, both in the form of galvanism and faradism, has also been found of value. Lastly, the judicious employment of hypnotism for certain cases has been suggested by Friedländer³ and others.

Summary of the Methods of Treatment.—It will be evident that, of the various therapeutic measures to which reference has been made, there are some which are only available for certain patients or under particular circumstances, so that no definite plan of treatment can be outlined which will be available in every case. An attempt may nevertheless be made to indicate certain broad lines on which the treatment of hay fever cases may be conducted.

The only method of prevention which can be regarded as certain is taking a sea voyage for the whole of the critical period; but the judicious selection of a residence, either on the coast of England or at one of the places on the Continent which have been mentioned, may secure the same object.

With reference to other possible methods of prevention, it may be said that a careful examination of the nose should be made in every case of hay fever, and surgical treatment recommended if an obvious intra-nasal lesion is to be detected —more especially if there are nasal symptoms at times other

¹ *Geneesk. Tijdschr. voor Nederl. Indië*, vol. xlv. No. 5.

² *Therapeutic Monthly*, July 1901.

³ *Münch. med. Woch.*, No. 37, 1908.

than the hay fever period. In the absence of any such morbid condition, the galvano-cautery or some similar agent for reducing the sensitiveness of the mucous membrane may be employed.

General or constitutional treatment by nerve tonics, such as phosphide or valerianate of zinc, is desirable in most cases, as having a tendency to reduce the severity of the attack.

As to the actual treatment of the malady when established, **pollantin** should in any event be given a trial (if not previously found to be ineffective), and the importance of its employment in a prophylactic manner (p. 67) should be emphasised. If **pollantin** fails, adrenalin or other palliatives may be administered. The further management of the attack consists in the observance of the precautions against the ingress of pollen which are detailed below (p. 84), as well as in the adoption of the different methods designed to palliate the various symptoms which may arise.

GENERAL CONSIDERATIONS AS TO DIET, MODE OF LIFE, ETC.

As the sufferer from hay fever is rendered sufficiently uncomfortable owing to the presence of his malady, it appears to the writer undesirable to increase the discomfort still further by unnecessary prohibition in the matter of diet, alcohol, tobacco, and so on; at the same time it must be said that strict moderation in these matters is to be recommended if the vigour of the attack is to be appreciably diminished. It has been suggested that animal food should be taken only once daily, and never in the evening, and this appears to be a good rule, at any rate for those suffering from hay asthma; hay fever patients in general will also find it advisable to avoid a too "generous" diet. If the patient is accustomed to take stimulants with his meals, a light wine, or whisky well diluted, will probably be the most suitable beverage.

With regard both to alcohol and tobacco, the writer considers that no general rule can be formulated as to the question of abstention from these luxuries. While some patients find that the consumption of their usual modicum of alcohol or tobacco causes no aggravation in the severity of the attack,

or may even be productive of benefit, others find that the attack is less severe when abstention is practised. The matter is therefore one which the patient may be allowed to decide for himself, always on the understanding that the excessive use of either agent is liable to render the attack more severe.

The mode of life within doors, especially for severe cases, practically resolves itself into methods of barricading the patient against the invasion of pollen. In the first place, the windows of the patient's bedroom should be kept closed as much as possible, and also others on the windward side of the house. Moreover, in whatever room the patient happens to be, measures should be taken to prevent any persistent current of air from passing through, as otherwise pollen will be liable to be constantly inhaled. Closed windows, especially in the summer, may of course become unbearable, and under these circumstances a device recommended by Blackley may be adopted. A wooden frame, about 6 inches deep and 1 inch from back to front, is made to fit the upper or the lower part of the frame of the window, so that when the latter is open the wooden frame will fit into the space thus made. The apparatus is covered on each side with muslin, and when in position is kept from moving by a thin wedge being pushed between it and the window-frame, or by some other device. When thus arranged the air will readily pass through, whilst pollen and dust will be excluded. The door of the room should, of course, be kept closed, as otherwise pollen will gain admission by this entrance.

In addition to these precautions against the direct entrance of pollen it is necessary, particularly if the patient lives in a district where hay-grass is prevalent, to guard against the introduction of the irritant on the patient's clothes or on those of other persons. Coats and similar articles should be brushed or shaken before entering the house, and in the case of linen bleached out of doors similar precautions should be observed.

Unless the patient wears some form of nasal "filter" he should, if possible, confine his walks abroad (at any rate during the most critical period) to rainy days. Concerning the subject of nasal filters, it may be said that numerous devices to prevent the pollen entering the nasal passages have been suggested, but most of the contrivances are more or less uncomfortable, either

owing to the fact that the wearer is unable to breathe properly through the nose or on account of the irritation of the apparatus or both of these disabilities in conjunction. A small plug of cotton-wool inserted into each nostril before the patient goes out of doors may prove of value, but it is advisable to accustom the patient to wearing these plugs before the hay fever period commences, and in any case sensitive patients may not be able to tolerate them.¹

In severe cases, where the patient is obliged to remain in the house for the whole or the greater part of the critical period, a sheet sprinkled with carbolic acid (10 grs. to the oz.) should be arranged so as to completely cover the doorway of the patient's room, the windows being protected in the manner described above.

¹ An apparatus known as the "Otto Schultz Nasal Respirator" has been devised for the use of hay fever patients. It consists of an oval ring of thin metal into which a piece of wool can be introduced so as to prevent the inhalation of pollen. It is inserted just within the nostrils, where, however, it is quite hidden from view. The apparatus is made by Nagel, jeweller, 22 Calenbergerstrasse, Hanover, Germany.

II. PAROXYSMAL SNEEZING (*VASOMOTOR RHINITIS*)

Syn. PAROXYSMAL RHINORRHEA, NERVOUS, PAROXYSMAL OR
VASOMOTOR CORYZA, SPASMODIC RHINITIS, ETC.

INTRODUCTION

Cur sternuentes salutamus? was a question propounded by Pliny more than eighteen centuries ago, and the answer to the enigma, the interpretation of the ancient and widespread belief that sneezing was an omen to be averted, is still to seek. The Greeks exclaimed *Zεῦ σῶσον* ("God save you") when a person sneezed; the Romans ejaculated *salve*; the Hebrews, *Tobim chayim* ("good life")—expressions not far removed from the salutations, "God bless you," "zur *Gesundheit*," and *Felicitá* of modern times. "The custom of blessing persons when they sneeze has without doubt been derived to the Christian world, where it prevails, from the times of heathenism. Bartholinus cites Pliny, Aristotle and others, to show that the ancients regarded sneezing as an omen, and the blessing customarily bestowed upon the sneezer as a deprecation of evil likely to arise."¹

According to Thucydides, sneezing was looked upon as a sign of very grave significance in the famous plague of Athens, and it has been conjectured that it was in consequence of this circumstance that the custom of invoking protection for the sneezer arose. "Concerning Sternutation or Sneezing," says Sir Thomas Browne, "and the custom of saluting or blessing upon that motion, it is pretended, and generally believed, to derive its original from a disease wherein Sternutation proved

¹ Brand and Ellis, "Dictionary of Faiths and Folk Lore." Ed. W. Carew Hazlitt, London, 1905, p. 553.

mortal, and such as Sneezed died. And this may seem to be proved from Carolus Siganus, who in his 'History of Italy' makes mention of a Pestilence in the time of Gregory the Great, that proved pernicious and deadly to those that Sneezed. Which notwithstanding will not sufficiently determine the grounds hereof: that custom having an elder *Æra*, than this Chronology affordeth.¹ The sneezing superstition is, in fact, as this author remarks, "more ancient than commonly is conceived," being older than Greek civilisation, and having been widely held, apparently, by many races in remote times.

Rabbinical tradition relates that sneezing was a sign of mortal significance, even from the time of the first man, until the ban was removed by the special supplication of Jacob; and in one of the ancient religious books of the Parsees the faithful are enjoined to have recourse to prayer when any of their number fall to sneezing, for it is "a proof that the Evil Spirit is abroad."

Similar rites have long been observed in Persia, India, Africa, and elsewhere. Indications that the custom existed in America would appear from the incident that during the Conquest of Florida by the Spaniards a certain cajique was observed to sneeze in the presence of his Court, whereupon his followers all lifted up their hands and implored the sun to avert the evil omen. The reports of missionaries and other travellers indicate that ideas of a similar character prevailed among the Kaffirs and other semi-civilised and savage races in different parts of the world.

Nevertheless, sneezing has not invariably been regarded as an evil omen, but was sometimes considered to be an indication of favourable import. We read in Xenophon's *Anabasis*² that when the fortunes of the army were at a low ebb, and the leader was addressing the dispirited host, one of the soldiers happened to give vent to a sneeze, upon which the whole army took the sign as a favourable augury, and paid adoration to the gods. Homer also relates in the *Odyssey* how a stentorian sneeze from Telemachus rejoiced the heart of Penelope, for she

¹ *Pseudodoxia Epidemica* ("Vulgar Errors"), 2nd ed., London, 1650, bk. iv. chap. ix.

² iii. 2, 9.

hailed it as a happy omen: Οὐχ ὁράς οὖ μοι νῦν ἐπέπταρε πᾶσιν ἔπεσσι—“did you not mark how my son sneezed as I was speaking? surely, this must mean that the suitors are all doomed, and that not one of them shall escape!”¹

Sir Thomas Browne, in the “Vulgar Errors,” discusses not only the medical aspect of sneezing but also its supposed augural signification—how it was held to be sometimes good and sometimes bad; how the ancients were wont to go to bed again if they sneezed when they put on their shoes; how “Aristotle hath a problem why Sneezing from noon unto midnight was good, but from night to noon unlucky;” and how “Eustathius upon Homer observes, that Sneezing to the left hand was unlucky, but prosperous unto the right.” Space will not permit of the further discussion of these and other interesting points propounded by the learned author, and it remains to consider whether there is any feasible explanation for the existence of this venerable custom. Of the various theories which have been advanced, that suggested by Tylor² appears to the writer to be the most probable. Briefly stated, it is to the effect that the idea was connected with the ancient doctrine of pervading and invading spirits, and that a sneeze was in some way regarded as a sign of the presence of these spirits—considered as good or evil as the case might be, and treated accordingly.³

In ancient medicine the act of sneezing was considered to possess important relationships with various diseases, especially in regard to the ultimate outlook or prognosis—the significance being sometimes of a favourable and at others of an unfavourable character. It was considered that sneezing was, properly speaking, a motion of the brain, whereby the organ expelled through the nostrils whatever was offensive to it, affording at the same time some indication of its vigour. The author of the

¹ *Odyssey*, xvii. 541.

² *Loc. cit.*

³ The sneezing superstition extends through an extraordinarily wide range of race, age and country; the habit of saluting the sneezer has nevertheless declined among the English-speaking races, and probably among others during the last fifty years, and the custom was never accepted by the Anabaptists and Quakers.

Religio Medici, quoting Aristotle, remarks that for this reason physicians administered sternutatories, or such medicines as provoked sneezing, to persons who appeared to be near death, "when if the faculty arise and Sternutation ensueth, they conceive hopes of life, and with gratulation receive the signs of safety. And so is it also of good signality, according to Hippocrates, that Sneezing cureth the hickett,¹ and is profitable unto women in hard labour; and so is it good in Lethargies, Apoplexies, Catalepsies, and Comas."² On the other hand, it was sometimes a bad sign, and gave "hints of deprecation," as in diseases of the chest, in which maladies Hippocrates condemned it "as too much exitating;" also, according to Avicenna, it was unfavourable at the beginning of catarrhs, "as hindering concoction."

The administration of sternutatories to persons *in extremis* was also practised in mediaeval and later times, as witness the case of Charles II., whose physicians prescribed various remedies to promote sneezing, in order that the pressure of the "humours" on the brain might be relieved. In the report of the monarch's last illness, drawn up by Sir Charles Scarburgh, one of His Majesty's physicians, it is stated that a powder composed of a drachm of white hellebore roots was prepared and kept in readiness to be applied to the King's nose as occasion demanded; and as the condition of the patient became more serious, "spirit of sal ammoniac was applied now and again to His Most Serene Majesty's nostrils, both as a cerebral stimulant, and to excite sneezing."³

Celsus,⁴ as well as Hippocrates, had observed that sneezing would cause the cessation of hiccough (*singultus sternumento finitur*); and Avicenna (*ob. 1037*) records the observation that the smell of roses would set up attacks of sneezing, which could be relieved by rubbing the eyes, ears, extremities, and palate (cf. p. 3). Testa (1790) refers to the case of a woman who was seized every third day with paroxysms of sneezing

¹ Hiccough.

² *Loc. cit.*, p. 170.

³ Crawfurd (Raymond), "The Last Days of Charles II.," Oxford, at the Clarendon Press, 1909.

⁴ A. Cornelius Celsus, *Medicinae*, lib. ix. cap. viii.

which were so severe that, for the time, she was entirely prostrated, and could neither eat, drink, nor sleep.¹

The ideas as to the nature and mechanism of paroxysmal sneezing, and similar manifestations, remained extremely vague until about the latter part of the seventeenth century, when, with the advance in the knowledge of nervous disease, some glimmerings of their reflex nature began to dawn upon the medical mind. As time went on it gradually became recognised that a number of morbid phenomena were capable of being set up by intra-nasal conditions, owing to excitation of the branches of the fifth nerve, the irritation being then reflected along the same path and leading to nasal manifestations, or, in other instances, being communicated to the vagus or other nerves, and resulting in disturbances in the throat, the lungs, the heart, and elsewhere.

The manifestations were finally grouped together under the generic title of "nasal reflex neuroses," and comprised a heterogeneous collection of sensory, motor and vasomotor phenomena. Of these, the present work is only concerned with hay fever, which was first described by Bostock in 1819, and with paroxysmal sneezing, upon which disorder a paper was written by Herzog in 1881.² Herzog proposed the name **rhinitis vasomotoria** for the affection, but it would seem that this designation also included hay fever. As already explained, the latter malady and paroxysmal sneezing are pathologically identical, and the reason for describing them separately is that they differ in the nature of the exciting cause, and also to some extent in the clinical manifestations, the treatment, and certain other respects.

ETIOLOGY AND PATHOLOGY

By the term paroxysmal sneezing, or vasomotor rhinitis, is understood a congeries of symptoms consisting usually of sneezing, nasal obstruction and hypersecretion, with or without lachrymation. One or other of these symptoms may, however,

¹ "Bemerk. über die period. Veränd.," etc., Leipzig, 1790, p. 225.

² "Der nervöse Schnupfen (rhinitis vasomotoria)," *Mittheil. d. Vereins d. Aerzte in Steiermark*, 1881. J. N. Mackenzie proposed the name "coryza vasomotoria periodica" for hay fever, but he afterwards changed this to "coryza sympathetica."

predominate, or in exceptional instances occur alone. The manifestations are set up as the result of peripheral or central impressions, and are sometimes associated with asthma or other reflex disturbances.

In order to gain a satisfactory idea of these processes it is desirable to consider for a moment the normal reflex phenomena which, in a manner, they represent. The mechanism of the normal act of sneezing is as follows:—The afferent nerves by which the stimulus is conveyed to the respiratory centre are the branches of the fifth nerve distributed to the nasal mucous membrane;¹ the efferent nerves are those which supply the respiratory muscles. As the result of an intra-nasal impression (which may arise at any point on the mucous membrane or may be conveyed to the nose from distant organs), one or more deep inspirations are taken, and are followed by a forcible expiratory effort, during which the glottis is widely open and the mouth shut off from the naso-pharynx by the soft palate and tongue. In this manner the entire respiratory blast escapes through the nose at high pressure, expelling mucus not only from that organ but also from the throat. At the same time other reflexes, such as increased secretion and swelling of the turbinal tissues, are usually set up.

For the production of reflex hypersecretion the afferent nerves are the same as those which convey the impulse for the sneezing reflex; and as regards the efferent nerves, Aschenbrandt considers that the impulse is conveyed to the nose by the branches of the sphenopalatine ganglion, both the sympathetic and the fifth nerve (through its superior maxillary branch) being concerned in the process.² On the other hand,

¹ The nasal nerve, from the first division of the fifth, supplies the anterior part of the nasal cavity corresponding to the external nose; the remainder of the cavity is supplied by the second division of the fifth through the sphenopalatine ganglion. There is also a small dental branch from the third division.

Katzenstein, of Berlin, claims to have discovered a "sneezing centre" in the frontal lobe, experimental irritation of which is capable of setting up the sneezing reflex.

² "Ueber den Einfluss der Nerv. auf die secret. der Nasenschleinh.," *Monats. für Ohrenheilk., etc.*, No. 3, 1885. Aschenbrandt found that stimulation both of the sphenopalatine ganglion and of the fifth nerve caused reflex secretion, the character of the fluid varying in the two instances; in the former the mucus wasropy and opalescent, in the latter it was clear.

Schäfer states that the view that the fifth nerve contains secretory fibres is now practically abandoned.¹

As to the efferent nerves for vaso-dilatation, it is not decided, so far as the present writer is aware, whether the impulse is conveyed from the medulla through the fifth nerve, or whether it reaches the nasal cavity through the sympathetic; for, as Morat² has shown, vaso-dilator nerves arrive at the nasal mucous membrane through both channels—from the medulla through the first and second divisions of the fifth, and from the other system by way of the sympathetic root of the sphenopalatine ganglion and that also of the Gasserian ganglion.

These reflexes of sneezing, secretion, and vaso-dilatation are among the defensive contrivances provided for the protection of the organism from dust, bacteria, and other deleterious elements which would otherwise gain admission to the respiratory tract. They are set in action by the physiological stimulus provided by the inspired air, and in order that their functions may be fulfilled in an adequate manner, the nerve fibres distributed to the nasal cavity are both abundant and highly sensitive.³ The nasal nerves may indeed be regarded as performing the duties of sentinels, stationed at a physiological outpost; and at the first indication of aggression the protective reflexes are brought into action, and proceed, so far as their powers extend, to expel the intruding elements. But the sensitiveness of the reflex mechanism possesses the disadvantage that it may develop into a state of morbid excitability; and under certain circumstances the nerves completely overstep the boundaries of normal physiological alertness and fall into a hypersensitive and irritable condition.⁴ This may occur

¹ "Text-Book of Physiology," Edinburgh and London, 1900, p. 662.

² "Recherches sur les Vasomoteurs de la Tête," *Arch. de Physiol. norm. et pathol.*, 1889, p. 538.

³ It is to be noted that some nasal reflexes are capable of being set in action by the olfactory nerves, as well as by those of common sensation. The former are nevertheless imperfect as a defensive arrangement, as there are many odourless gases which would be extremely harmful if inhaled, but which of course cannot be recognised by the sense of smell.

⁴ Different individuals vary in regard to the normal activity of these reflexes, in much the same manner as people vary in reference to the acuteness of the sense of smell; the occurrence of these manifestations, even when rather conspicuous, is therefore not necessarily pathological.

as the result of a local disturbance in some part of the reflex arc, or in consequence of some general disturbance of the nervous system, as in neurasthenia, hysteria, and the like; but whatever the cause, the effect is that the normal resistance to the convection of nervous impressions becomes impaired, and the reflexes are precipitated—usually in a perverted or exaggerated manner—by causes which normally would not be sufficient to set them in action. In this manner the conditions of paroxysmal sneezing, paroxysmal rhinorrhœa, vasomotor turgescence and so on, come to be developed. And not only is this the case, but, owing to the numerous communications, direct and indirect, which the sensory nerves of the nose effect with the nerves of other parts, owing perhaps also to the close relation between the various bulbar nuclei, reflex disturbances in relatively distant regions, such as the larynx (spasm of the glottis), and the bronchi (asthma), may be set up.¹

The whole subject of the pathogenesis of the nasal reflex neuroses in general is greatly in need of further elucidation, and at present one is, to a great extent, reduced to hypotheses to explain the various manifestations. When the reflex arises in the nose and produces symptoms in the same organ—as in hay fever and many cases of vasomotor rhinitis—the reflex path is not so difficult to trace as when the process is initiated in another organ, and results in the production of nasal symptoms. In the first case, as we have seen, the impression is conveyed to the centre by the fifth nerve, while the efferent nerves are those which supply the vessels and the glands. It has been considered by Jurasz,² Zarniko,³ and others, that the

¹ François Franck ("Contr. à l'ét. expér. des névr. réfl. d'orig. nas.," *Arch. de Phys. norm. et path.*, 1889) showed by experiments on animals that irritation of the nasal mucous membrane was capable of setting up spasm of the glottis and of the bronchi. Lazarus ("Ueber Reflexe d. Nasenschleimh. auf d. Bronchiallumina," *Arch. für Anat. und Phys.*, 1891) demonstrated that the efferent path for the reflex bronchial spasm was the vagus.

² Heymanns "Handbuch der Laryngologie und Rhinologie," Bd. iii. H. 2, Wien, 1900, p. 671.

³ "Krankheiten der Nase und des Nasenrachens," 2nd ed. Berlin, 1905, p. 587.

impression is not necessarily transmitted through the brain or spinal centres in all instances, but that it may take a shorter circuit through the peripheral ganglia. Zarniko refers to the works of Hermann¹ and of Schwalbe² in support of the contention that the sympathetic or other homologous ganglia are capable of acting as reflex centres; but although the question has been the subject of much controversy, it seems, at the present time, to be generally acknowledged that the ganglia are incapable of acting in this manner, as there is no possibility of a complete reflex arc in connection with these structures.

In the second instance, that is to say, when reflex vasomotor and secretory disturbances are set up in the nose owing to an extra-nasal cause (as, for example, from sudden cooling of the skin), it is not easy to specify the manner in which the impression is conveyed to the centre, or to point out the exact centrifugal path by which it is transmitted to the nasal cavity. The suggestion has been made that certain of the bulbar nuclei, especially those of the vagus and the fifth nerve, are in a peculiarly irritable condition in certain subjects, and are then especially ready to transmit centrifugal impressions, the close contiguity or intercommunication of the various nuclei also rendering it possible that an impression received by one of them may spread to another, and so to the peripheral organ.

We may next consider the special factors which, under various circumstances, appear to act as **predisposing and exciting causes** of the affection under discussion.

Predisposing Causes.—The general considerations concerning the **racial distribution** of vasomotor rhinitis are similar to those cited in connection with hay fever (p. 12). **Climatic conditions** are of course of less significance in the former malady than in the latter, although atmospheric influences are factors which frequently come into play. Zegers has recorded some interesting observations concerning the occurrence of vasomotor rhinitis in the tropical region of the Dutch East Indies.³ According to this observer, the malady is common in Java and other parts of the colony, but does not usually appear until

¹ Hermann, "Handbuch der Physiologie," Leipzig, 1879-1882.

² Schwalbe, "Lehrbuch der Neurologie," Erlangen, 1881.

³ *Geneesk. Tijdschr. v. Nederl. Indië*, Bd. xli. H. 3.

the patient has resided there for a considerable time. It is evidently not due directly to the heat, as patients suffer from it when residing at an altitude of 3500 ft. A curious feature of the attacks is that they cease to occur if the patient leaves the colony to come to Europe;¹ and they do not reappear unless he returns to the East Indies. Zegers considers that the cause is probably dust, coupled with a diminished power of resistance brought about by residence in the tropics.

The usual **age** at which the neurosis develops is between fifteen and forty, but numerous instances have been observed before the former period and after the latter. Garel² gives the following table as to the age incidence in ninety-one cases of vasomotor rhinitis which were observed:—

Age 10-20	.	.	.	.	.	12 cases
„ 20-30	.	.	.	.	.	27 „
„ 30-40	.	.	.	.	.	29 „
„ 40-50	.	.	.	.	.	8 „
„ 50-60	.	.	.	.	.	2 „

(In thirteen cases the age was not ascertained.)

As regards **sex**, females appear to be more liable than males, in which respect the affection offers a contrast to hay fever (see p. 14).

The influence of **heredity** is in many instances unmistakable. The malady is also apt to evince a curious affinity or interchangeability with asthma. Thus, a parent may suffer from paroxysmal sneezing or asthma (or in some instances both affections) while one or more of the children may give evidence, in the course of time, of similar conditions. Ball investigated the question of heredity in 112 cases, and found evidences of paroxysmal sneezing or asthma, or both, in 33 per cent.³ Ringer and Murrell also quote examples bearing on this point.⁴ In one instance the female parent suffered from asthma, while of her two children one was subject to asthma and the other to

¹ Zegers says that the malady vanishes "as soon as the ship has left the harbour."

² "Le Rhume des Fois," Paris, 1899.

³ "Paroxysmal Sneezing and Allied Affections," *Lancet*, 1899, vol. i.

⁴ "Remarks on Paroxysmal Sneezing," *Brit. Med. Journ.*, 1888, vol. i.

paroxysmal sneezing. In another instance the female parent suffered from paroxysmal sneezing, and of her three sons one gave evidence of severe attacks of the same disorder, one snuffed from hay asthma, and the third from morning attacks of sneezing.

The **social position** of the patients, although a marked influence in the case of hay fever (being almost exclusively confined to the better classes), is not so noticeable a factor in paroxysmal sneezing; the latter affection is nevertheless more prevalent among the more highly educated classes than among the labouring population.

As in hay fever, the peculiar susceptibility or predisposition is an important element, and, also, as in that disorder, it consists in some abnormality of the nervous system (leading to an undue excitability of the nerve centres), or in a peculiar hyperaesthetic condition of the sensory nerve fibres distributed to the nasal mucous membrane, especially in the presence of particular irritants, or finally in a combination of these factors. The genesis of the predisposition itself is in most instances connected with the general state of the **nervous system**, and what is known as the "nervous temperament" is usually present; or there may in some cases be evidence of general nervous debility, of neurasthenia, or of hysteria. Some authors (Herzog¹ and others) consider that both vasomotor rhinitis and hay fever are in the majority of cases a symptom, practically, of general neurasthenia. Hornung, while agreeing as to the nervous origin of vasomotor rhinitis, holds the view that it represents especially an affection of the sympathetic.²

Certain observers believe that a tendency to arthritism, and especially to **gout**, is an important predisposing cause of the affection, while others consider that a combination of the gouty diathesis with a neurotic tendency is a factor of especial importance. In view of the capabilities of **influenza** in causing various nervous disturbances, it is not surprising that an attack of this malady has frequently been regarded as the starting-point of the nasal affection.

¹ "Der ac. und chron. Nasenkatarrh," 2nd ed., Graz, 1886. Also, *loc. cit.* (ref. ², p. 90).

² "Ueber nervös. Schnupfen," *Mittheil. d. Wien. med. Doctoren-Collegiums*, March 21, 1892.

The **direct or exciting causes** which in predisposed persons tend to precipitate the attack are so very numerous, and of such divers characters, that it is desirable, for the sake of conciseness, to consider them under special headings.

Mechanical Causes.—The influence which intra-nasal abnormalities exert on this and similar reflex neuroses has been much debated, and is discussed in the present volume in connection with hay fever. As similar considerations are applicable in regard to paroxysmal sneezing, the reader is referred to the remarks in connection with the subject at page 26.

Among the agents coming in the category of mechanical causes are dust of various kinds; smoke; various medicinal and other powders (*e.g.* ipecacuanha, salicylate of soda, scammony, linseed, etc.); also the emanations from cats, dogs, horses, and other animals—these irritants being also capable of setting up asthma as well as paroxysmal sneezing.¹

In the case of some special forms of dust, or other irritant, the conjunctival mucous membrane is also affected, and the symptoms may then bear a close resemblance to the first stage of hay fever. The affection designated by Fränkel *Eisenbahnschnupfen* (p. 52), and referable to the dust of a railway train, is an example of this; as also is the peculiar disorder, dependent on the stellate hairs from the leaves of the plane-tree, described by Rosenfeld (p. 53). The same observer records the case of a lady who suffered from coryza whenever she undertook the cleaning of her parrot, the symptoms being set up owing to the numerous pointed particles, derived from the feathers, which were inhaled during the process. Bastian records that when dissecting the *Ascaris megalocephala* from the horse he suffered from irritation of the nose, manifested by hypersecretion and continuous sneezing, together with lachrymation, itching of the eyelids and carunculae, and irritation of the skin.²

¹ The tree known as “sneeze-wood” (*Pteroxylon utile*; nat. order Sapindaceae), which grows in Cape Colony, derives its English name from the Dutch *Nies-hout*, owing to the irritating nature of the dust which results from sawing or otherwise working it, and which is very liable to set up sneezing.

² *Philosoph. Trans.*, clvi. p. 583.

The irritation caused by foreign bodies, which have gained admission to the nasal cavities, is not usually signalled by sneezing, except in some instances in which the substance possesses sharp angles. When the foreign body is of this nature the symptoms may resemble those of an acute rhinitis, and sneezing will then occur as one of the manifestations. Mellor, however, reports a case of paroxysmal sneezing in which the attacks were set up owing to the presence of a long hair that was lying inside the nose.¹ Living insects or worms in rare instances gain access to the nasal cavity, and may then lead to violent attacks of sneezing, together with numerous other reflex disturbances.² Cases have also been reported by Réthi and others in which sneezing and similar manifestations have been set up as the result of intra-nasal operations.³

Sneezing is a prominent symptom in acute rhinitis, especially in the early stages; the symptom may also be observed in chronic nasal catarrh, more particularly in nervous subjects, and it occasionally occurs in connection with mucous polypi (see also p. 102). The precise manner in which acute or chronic inflammatory processes produce the manifestation is not entirely clear—whether, for example, it is due to mechanical pressure on the nerve-endings, referable to the swelling which occurs, or to changes of a chemical character in the tissues.⁴

Various **atmospheric conditions** are liable to set up the attacks. Thus, if a sudden change of temperature be experienced, as when the patient goes from a warm room into the

¹ *Brit. Med. Journ.*, March 21, 1903.

² Tiedemann, "Von lebend. Würmern und Insecten in den Geruchsorg. des Menschen," Mannheim, 1844.

³ Réthi, "Neurosen, entsteh. durch Behand. d. Naseninneren," *Int. klin. Rundschau*, 1889.

⁴ It may be mentioned, in this connection, that Lewy has found actual organic changes in the nerve-endings in two instances of nasal reflex neuroses. The local cause of the manifestations was chronic hypertrophic rhinitis, and the hypertrophied tissues showed, on removal, a very large number of thickened nerve branches situated immediately beneath the surface of the mucous membrane (Lewy, *Arch. für Laryngol. und Rhinol.*, Bd. 12, H. 1). In a severe case of vasomotor rhinitis, occurring in the practice of the present writer, the condition of the nerves was examined, in portions of mucous membrane which were removed, but the structures were found to be normal.

cold air, or the reverse, sneezing or other manifestations may occur. In some instances the condition is more troublesome in damp weather; in other instances it is aggravated by dry, cold winds; and in others, again, the prevalence of a south wind is regarded as a cause. Generally speaking, however, when the atmosphere is fresh the attacks are not so frequent.

A great variety of **tactile and sensorial impressions** may excite the paroxysms. The action of cold air on the skin, for example, as when the patient rises from bed in the morning, is very apt to bring on an attack; or a sudden draught may have a similar effect. A tactile impression, such as that produced by touching the nose or introducing a nasal speculum, or one resulting from merely combing the hair or touching the scalp, may also be sufficient to induce an attack. Molinié records the case of a lady who, *après avoir fait une toilette élégante*, of which the finishing touch was the arrangement of a covering of artificial hair on the forehead, was seized, almost daily, with severe sneezing and rhinorrhœa. The affection resisted all treatment until, on Molinié's suggestion, the artificial locks were abandoned, whereupon the symptoms completely and permanently disappeared.¹

Impressions on the special senses may prove fruitful sources of trouble. A number of perfumes, such as those of roses, violets, cypress, camphor, heliotrope, etc., and certain substances which produce both a gustatory and olfactory impression, as liqueurs (chartreuse, kümmel, vermouth), have all been observed to act as exciting causes. An impression on the auditory nerve, as in the case of a sudden loud noise, may set up a fit of paroxysmal sneezing, and, like many other of the sensory impressions which have been mentioned, it may also induce an exacerbation of hay fever in predisposed persons (see p. 47). The manner in which sneezing may be produced by bright sunlight is referred to at page 18; L. Freund concludes, as the result of some experiments made with coloured glasses, that the reflex, when induced by this cause, is chiefly referable to the action of the blue-violet rays.² In connection with optical

¹ Molinié, *Gaz. des Hôpitaux*, 1899, p. 481.

² "Ueber das Niesen," *Centralbl. für d. physik. Therapie und Unfallheilk.*, H. 1, 1904.

causes, it may also be mentioned that instances of paroxysmal sneezing apparently due to eye-strain, or in which, at any rate, the symptoms have ceased after rectifying defective accommodation, have been reported by Gould¹ and Herron.² Hack has described certain other forms of irritation arising in the eye which he considered to be capable of setting up the nasal manifestations.³

A **psychical** factor is often in evidence, not only in relation to the induction of the neuroses but also in connection with its arrest or disappearance; and while emotional disturbance is often observed to lead to an attack, a degree of mental perturbation may, in some cases, produce the opposite effect. Thus, a patient suffering from nasal obstruction, due to reflex turgescence of the turbinal tissues, will sometimes remark, when seated in a chair in preparation for rhinoscopic examination, that the nose has become entirely free; or the mental effect may be sufficient to cause collapse of the turbinal tissues as soon as the patient enters the consulting-room. The possibility of the attack being precipitated owing to mental impressions, implies in all likelihood a morbid excitability of the centre; and so long as the mind is occupied, the paroxysms in a habitual sneezer often remain in abeyance, owing probably to the cerebral activity being diverted to other centres.⁴ Psychical influences also account for the peculiar mimetic or contagious character of the neurosis which may sometimes be observed; for when several persons subject to the affection are

¹ *Philadelphia Med. News*, No. 60, 1892, p. 300.

² *Memphis Med. Monthly*, January 1893.

³ "Ueber eine operat. Radicalbehandl. best. Formen von Migräne, Asthma, Heufieber sowie zahlr. verwand. Erscheinungen," Wiesbaden, 1884.

⁴ On the other hand, the affection, which in the matter of etiology is a truly eccentric disorder, may be induced by this very cause. Dr. Herbert Tilley, in his work on the "Diseases of the Nose and Throat" (London, H. K. Lewis, 1908, p. 52), refers to the case of a lady, with whom he is acquainted, who invariably suffers from paroxysmal sneezing and rhinorrhœa when she engages in work requiring any considerable amount of mental concentration. Dr. Tilley, in a private communication, gives me the further interesting particulars that the lady is of the healthiest and most stolid temperament imaginable, and so far as he is aware is not affected by any other cause than that mentioned.

gathered together, and one of the number has an attack of sneezing, it is by no means rare for the others to follow suit.¹

Paroxysmal sneezing has been stated never to occur during sleep or when the patient is completely under the influence of an anaesthetic, but cases have been reported in which the manifestations have occurred under both these circumstances. Wells reports, in connection with the case referred to at page 108, that the attacks of sneezing persisted during sleep and were uninfluenced by chloroform narcosis. L. Chalke records an instance in which a patient, who was anaesthetised for extirpation of the eye, gave evidence of violent sneezing as soon as the speculum was introduced. The paroxysms lasted about two minutes, by the end of which period the patient had partly recovered from the anaesthetic; and after a second administration and a renewed attempt to introduce the speculum, the same phenomenon recurred. The difficulty was finally overcome by anaesthetising the patient and dropping cocaine solution into the eye before attempting to operate.²

Among other causes of the disorder are digestive disturbances and the consumption of particular articles of food, such as strawberries (Natier, Molinié), fresh or cooked sorrel, and tomatoes.³ Affections of the stomach,⁴ the liver,⁵ the reproductive organs⁶ and other parts; violent exercise; staying in

¹ Molinié, *loc. cit.*

² "Sneezing while under Chloroform." Quoted from the *Indian Medical Record, Lancet*, December 22, 1893.

³ Muenich, *St. Louis Clinique*, November 1892.

⁴ Secchi, "Ueber vasomot. Aff. der Nasenschleimh.", *Congr. für Otolog. in Brüssel*, 1888.

⁵ Cahn, "Acut. und chron. Bronch., verurs. d. Nasenpolyp., Paroxysm. Schnupfen bei abdom. Affect.", *Zeitschr. für pr. Ärzte*, 1896. In one of Cahn's cases (an instance of biliary colic), attacks of paroxysmal coryza occurred simultaneously with the attacks of abdominal pain. In another case the nasal affection appeared to be set up owing to the pain resulting from a round ulcer of the stomach.

⁶ Both physiological and pathological conditions of these organs may be associated with the neurosis in one or other of its forms. See papers by J. N. Mackenzie (*Amer. Journ. Med. Sci.*, 1884, vol. lxxxvii. p. 360), Peyer (*Münch. med. Woch.*, 1889, 36, pp. 38, 60), Oppenheimer (*Berlin. klin. Woch.*, 1892, vol. xxix. p. 1004); also Stalpart van der Wiel (*Observat. Rarior. Medic. Anatom. Chirurg. Cent. Post. Pars Prior, Leidæ*, 1727).

close, overcrowded rooms, and a multitude of other causes have also been found to be capable of setting up the manifestations in predisposed persons. Lastly, in certain instances no definite cause whatever can be discovered.

Association of Paroxysmal Sneezing with other Affections.—The association of the neurosis with **asthma** is one which is frequently observed. Of 112 cases collected by Ball, exactly one-half gave evidence of asthmatic symptoms.¹ Moreover, in a large number of instances in which an asthmatic does not actually suffer from the nasal affection, there is a history of former attacks which have ceased to reappear. The curious manner in which a family history of asthma and paroxysmal sneezing may alternate has already been referred to (p. 95). Other evidence of affinity is supplied by the circumstance that similar methods of nasal treatment are often applicable for both affections.

When the two neuroses coexist, the relationship, as to incidence, which the one disorder bears to the other is variable. In some instances an attack of paroxysmal sneezing (with, in many cases, rhinorrhœa) is the herald of the approaching bronchial attack; in others the two affections may run concurrently; and in a third group of cases the subsidence of the asthmatic attack is marked by the occurrence of paroxysmal sneezing and rhinorrhœa, lasting, it may be, with intermissions, for some hours or days. Sometimes paroxysmal sneezing persists for months or years and then ceases to occur, while the asthma continues for the rest of the patient's life.

With regard to the relationship of paroxysmal sneezing and rhinorrhœa to **nasal polypi** with which the former are often associated, it has generally been held that the sneezing and hypersecretion are due to the irritation set up by the presence, and especially the movements, of these growths. This would imply that the symptoms in question were the effect and not the cause of the polypi, and that they followed, in point of time, the development of the latter. On the other hand, Morell Mackenzie considered that polypi only occasionally set up the neurosis under discussion, and it is, moreover, well known that the removal of polypi, even when thoroughly performed,

¹ Ball, *loc. cit.*

frequently fails to relieve the symptoms peculiar to the neurosis. My own observations have led me to believe that in a large number of cases the sneezing and rhinorrhœa precede the formation of the growths, and that the former conditions are probably connected with the causation of the polypi. The notes of a number of cases of ordinary bilateral polypi, not associated with accessory sinus suppuration, which I have collected, indicated that in many instances a history was to be obtained of sneezing and rhinorrhœa which preceded the occurrence of the nasal obstruction, set up by the polypi, by periods of varying length—in one instance by an interval of eight years. The following three cases may be cited in connection with this point:—

A. B., female. Bilateral polypi. Attacks of paroxysmal sneezing began about twelve months before any nasal obstruction was observed, and the former symptom had entirely ceased before the patient came under observation.

E. S., female, aged 49. Polypi in both nasal cavities. The patient had no nasal symptoms whatever until she reached the age of 43, when sneezing and running from the nose commenced. These symptoms continued for about two years, at the end of which period nasal obstruction began to be noted. At the time of observation the patient stated that there was still some watery discharge at intervals, but that it was less marked than formerly.

E. J., male, aged 74. Polypi in both nasal cavities, but more marked on the left side. No nasal symptoms until the age of 64, when the patient began to suffer from paroxysmal sneezing and rhinorrhœa. This condition persisted for about eight years, when nasal obstruction began to be observed, especially on the left side. The rhinorrhœa was still present at the time of observation.

The observations of certain other rhinologists tend to support my own conclusion that in a large number of instances the reflex disturbances precede the formation of the polypi. Ball has expressed the opinion that in some cases it is "probable that paroxysmal sneezing existed before the development of the polypi, and it seems that the complaint favours the

growth of polypi."¹ Bosworth has reported two instances of paroxysmal rhinorrhœa (in one case associated with marked attacks of sneezing) where polypi were perceived to develop while the patient was actually under observation.² A well-known French observer, Jacques, remarks, in reference to the pathogenesis of these growths, "Il existe une certaine catégorie d'œdèmes polypoïdes, que l'on rencontre en dehors de toute action locale de nature irritative et inflammatoire, comparables chimiquement et anatomiquement aux précédents, et dont il faut chercher le point de départ dans une perturbation dans le domaine du système nerveux vaso-moteur. Tels sont les polypes accompagnant nombre de névroses nasales, l'hydrorrhée en particulier."³

The present writer has discussed what he considers to be the pathogenetic relationship of the neurosis to the development of mucous polypi, in previous publications.⁴

Vasomotor rhinitis may also be associated with **various other affections**, in some cases as a common event, in other instances as a rare occurrence. In addition to eye symptoms, such as lachrymation and conjunctival congestion, a number of other reflex disturbances may be observed. Thus, there may be paroxysmal cough, headache, hemicrania, trigeminal neuralgia, or painful sensations radiating to the frontal region, the ears, the teeth and other parts; there may also be a hyperaesthetic condition extending throughout the area supplied by the fifth

¹ *Loc. cit.*

² "Diseases of the Nose and Throat," 3rd ed., London, 1897, pp. 145-147.

³ Jacques (P.), *Rev. heb. de Laryngol., etc.*, October 31, 1903, p. 531.

⁴ "Polypus of the Nose," Manchester and London, 1906, p. 62. *Brit. Med. Journ.*, October 1907. Briefly stated, the author's theory is to the effect that owing, on the one hand, to an inflammatory process, which leads to swelling of the mucous membrane and thus to obstruction of the orifices of the glands; and on the other hand to constant overloading of the glands due to reflex hypersecretion or other known causes, the structures in question distend, by degrees, to many times their original size, and exert so great a pressure on the network of capillaries and veins, which closely surrounds them, that the return circulation becomes obstructed, and, as a consequence, œdematosus infiltration of the tissues—which is admitted to be the first stage of polypus formation—is brought about.

nerve.¹ R. J. Lee has reported a case in which attacks of sneezing and yawning occurred alternately for a period of seven weeks. Whichever manifestation was in evidence continued uninterruptedly except during sleep, and the exciting cause appeared to be the extraction of two molar teeth.² In some cases palpitation, praecordial oppression and other cardiac symptoms, attributed to reflex irritation, have been noted as occurring in connection with vasomotor rhinitis.³

The association of vasomotor rhinitis with malaria has been noted by Chappell,⁴ Loeb and others. The former has collected a number of cases in which the nasal symptoms were manifested periodically, coinciding with the attacks of malaria, and both the authors referred to have observed that the nasal attacks ceased on the administration of quinine.

Doelmann records the case of a man, suffering from obstinate attacks of paroxysmal sneezing, in whom a tuberculous condition developed at the apex of the right lung. It was observed that, as the pulmonary condition became established, the sneezing disappeared; but after a year's treatment the patient was apparently restored to health, so far as the former affection was concerned, and the sneezing attacks thereupon returned with the same intensity and frequency as before.⁵

Reference has already been made to the association of paroxysmal sneezing with hysteria and other functional diseases of the nervous system, and in this connection a case reported by De Rechter may be cited. The patient was a girl, aged thirteen, who had displayed a number of nervous symptoms and had suffered from continuous sneezing, except during sleep, for fourteen days before coming under observation. The sneezes numbered thirty or forty per minute, but were not accompanied

¹ Molinié, *loc. cit.*

² *Med. Press and Circular*, January 11, 1888.

³ With reference to the subject of functional cardiac disturbances in relation to this affection and to other nasal reflex neuroses, see papers by Küpper (*Deutsche med. Woch.*, 51, 1884) and von Stein (*Monatschr. für Ohrenheilk.*, 1889, pp. 196, 226); also a monograph by Fliess (*Neue Beiträge zur Klinik. und Therap. der nasalen Reflexneurosen*, Wien, 1893).

⁴ *New York Med. Journ.*, September 29, 1894.

⁵ Doelmann, "Niezen," *Nederl. Tijdschr. v. Geneesk.*, ii., No. 6, 1909

by any increased secretion. The treatment consisted in "fixing" the patient and commanding her in an impressive manner to stop sneezing; this proved successful, and the paroxysms immediately ceased and did not reappear.¹

Although in such cases as the foregoing, and in other instances, the possibility of paroxysmal sneezing being due to central nervous causes is brought into prominence, the affection is probably never due to organic disease of the brain. Morell Mackenzie, referring to Nothnagel's formidable list of possible symptoms which may be caused by diseases of the brain, remarks that this observer makes no mention of sneezing; Mackenzie also cites Althaus as having stated that he had neither seen nor heard of an instance of sneezing set up by disease of the brain.² Paroxysmal sneezing is likewise very uncommon in cases of "ozæna" (fœtid atrophic rhinitis), owing apparently to the degenerative changes in the nerve-endings which accompany the morbid process in the mucous membrane.³ The same considerations also apply in those instances in which destructive processes, set up by malignant disease or other causes, are in existence.

Various **pathological findings** have been recorded by different authors, but there is no general agreement as to the nature of the morbid conditions or even as to their existence; for some observers consider that, in the intervals between the attacks, no abnormal appearances are usually to be detected in the nasal cavity. Other observers, while holding the view that pathological conditions may sometimes be absent, consider that they are more frequently found in connection with vaso-motor rhinitis than with hay fever. Bresgen⁴ and others are of the opinion that chronic changes in the mucous membrane (especially hyperplastic conditions) are essential to the production of the malady; Hack held the view that erectile swelling of the mucous membrane was the cause of this as

¹ De Rechter, *Journ. de Méd., de Chir. et de Pharmacol.*, No. 4, 1889.

² Morell Mackenzie, *loc. cit.*, p. 79.

³ The existence of these changes can often be demonstrated clinically, by palpating the nasal mucous membrane with a probe, when the sensibility will be found to be diminished.

⁴ "Krankheits- und Behandlungslehre der Nasen- Mund- und Rachenhöhle," 2 Aufl., Wein und Leipzig, 1891, p. 156.

well as other nasal reflex neuroses. Cheatle has observed the occurrence of marked hypertrophy of the fibrous tissue in the region of the septal tubercle in a case of paroxysmal sneezing.¹

Hornung has examined the blood and nasal secretion in cases of vasomotor rhinitis, and has found deficient haemoglobin and leucocytosis in connection with the former, while in the nasal mucus many eosinophile cells were observed.²

SYMPTOMS AND DIAGNOSIS

As already mentioned, the terms paroxysmal sneezing and vasomotor rhinitis are employed to designate a group or congeries of nasal symptoms one or other of which may preponderate, and thus lead to certain variations in the clinical picture. Whatever the precise nature of the disturbance, it is liable to be preceded by certain premonitory indications, such as burning or tickling sensations in the nose or eyes, a feeling of formication across the bridge of the nose, headache, slight general malaise (which may also be observed during an attack) or other symptoms.

In a type of case which is commonly observed, the actual attack is manifested by sneezing, rhinorrhœa and nasal obstruction, with or without lachrymation. The eye symptoms, which may occur, are, generally speaking, much less conspicuous than in hay fever, although in exceptional instances marked congestion and irritation of the conjunctiva, and even a degree of photophobia, may be present. These symptoms develop abruptly and last for periods of varying length, ranging from a few minutes to several hours; or they may persist in certain instances even for two or three days, and, in any case, depart as suddenly as they appeared. In some patients the nasal obstruction is relieved by the rhinorrhœa, and the headache may also be mitigated under the same circumstances. The paroxysms are apt to occur in the morning, as soon as the patient rises; or the attack may take place both night and morning, or be manifested at irregular intervals.

¹ *Proc. Laryng. Soc. Lond.*, November 1898.

² R. Lake suggests that rhinorrhœa may be due to some change in the blood, and has found calcium chloride of value.

The morning paroxysm is probably induced, in many cases, by the stimulation of the skin which the colder atmosphere affects when the patient rises from bed.

The tendency to a regular periodicity is often a conspicuous feature in this affection, and it is somewhat difficult to determine the factors to which this periodicity is referable. Morell Mackenzie believed that it could be explained by the "mere force of physiological or pathological habit"—a tendency which is observed in connection with the normal digestive functions and with certain morbid conditions, such as neuralgia or ague, and which possibly operates through the unconscious nerve centres.¹ Bosworth considers that the diurnal periodicity indicates that the causes, which act to produce the symptoms, are operative only under certain atmospheric conditions.²

On rhinoscopic examination nothing characteristic may be detected if the patient be examined in the interval between the attacks; but when the paroxysm is in progress, considerable swelling of the mucous membrane is often to be observed, and this may be so marked in the lower parts of the nasal cavity that nothing but the swollen anterior ends of the inferior turbinates may be visible, the application of cocaine being necessary to obtain a view of the remaining parts. The mucous membrane usually presents a pale or palish-red appearance, and the inferior meatus is often seen to be full of serous secretion.

There are a few further points in connection with the three main symptoms (sneezing, nasal obstruction and rhinorrhœa) which may be briefly considered.

The **sneezing** is frequently the most troublesome manifestation and may exceptionally be the only one. The act may be repeated a vast number of times, until, indeed, the patient is reduced to a condition of complete exhaustion. Ball reports an instance in which the patient sneezed as many as 294 times in succession, and Wells³ records a case in which there occurred from forty to seventy-five sneezes in the space of a minute,

¹ *Loc. cit.*, p. 78.

² *Loc. cit.*, p. 149.

³ *National Med. Rev.*, May 1899.

while Mosler¹ probably establishes a record with his report of a patient who, in the course of eighty hours, sneezed 48,000 times!

Pathological sneezing differs from the normal act, not only in such respects as the tendency to be set up by unusual causes, the propensity to vain repetition, and so on, but also in the circumstance that it usually fails to relieve the feeling of irritation and tickling in the nasal cavity, or at any rate that it does not produce the sensation of relief and satisfaction which is normally experienced. Moreover, certain accidents, usually, however, of a minor character, may happen as the result of the violence or the prolongation of the paroxysms. In addition to the exhaustion, or even collapse, which occurs in some cases, epistaxis may be set up or headaches may be induced; or the more severe complications of hernia, or of rupture of important vessels, especially in cases in which atheromatous degeneration is present, may in exceptional instances occur.²

The **rhinorrhœa**, although usually associated with a certain amount of sneezing, and sometimes with other symptoms, may exceptionally occur alone. The neurosis, when taking this form, is termed "idiopathic rhinorrhœa" (or "nasal hydrorrhœa"), and is then characterised by an abundant, usually clear and watery, discharge from one or both nares.

The amount of fluid which escapes from the nose in these paroxysmal neuroses is very variable, in some cases amounting only to a few drops, and in others reaching to a pint or more in the twenty-four hours. The period of occurrence of the rhinorrhœa is generally the daytime; the discharge may also take place night and morning, and less commonly the symptom is more marked during the night, as in a case of the author's, in which five or six handkerchiefs were used before the patient fell asleep, and, in addition, the pillow-slip generally became more or less soaked with the nasal secretion. An excoriated

¹ "Fall von Nieskampf," *Virchow's Archiv.*, Bd. xiv.

² Bobone (*Journ. of Laryngol., etc.*, 1887, vol. i. p. 11) has reported a case of paroxysmal sneezing in which, owing to the frequency and prolongation of the expiratory act, the patient became cyanosed, and finally fell into a state of syncope.

or eczematous condition of the upper lip and neighbouring parts may be set up owing to the irritation of the discharges. The chemical composition of the nasal fluid, and also certain other particulars, are referred to at page 125, in connection with idiopathic rhinorrhœa.

The **nasal obstruction**, due to vasomotor turgescence of the turbinal mucous membrane, is, in some instances, the only manifestation of the neurosis; and even when other symptoms predominate, there is generally more or less "stuffiness" of the nose. The condition occurs intermittently, and is often noticed to affect either nasal cavity alternately. In many cases the obstruction is especially noticeable when the patient lies down at night, and if a position on the side be adopted, it is often found that the lower nostril becomes the more blocked of the two. On rhinoscopic examination no swelling or turgescence of the parts may be observed, especially if the patient be a nervous subject, for in such persons, as already mentioned, the "ritual" of the examination often suffices to produce a degree of mental perturbation, which acts on the turbinal tissues through the vasomotor nerves, and leads to the disappearance of the "stuffiness" or obstruction that may have been in evidence a few minutes before. If, however, the condition is still present, one or both inferior turbinates are seen to be swollen, and are often found to be in contact with the septum. In some cases, although both subjective and objective indications of obstruction are present (as proved by testing the patency of the nasal passages), no evidence of turgescence of the mucous membrane is to be seen by anterior rhinoscopy, and the symptoms may then be found to be due to intermittent tumefaction of the posterior ends of the inferior turbinates on one or both sides.¹ This condition has been observed by the present writer in a few instances, and cases of a similar character have been reported by Muck.² In the writer's cases there were no permanent hypertrophic changes in the posterior

¹ It is to be noted that nasal obstruction may be a purely subjective symptom, the nose on examination being found to be perfectly free, while to the patient it feels as if the organ were blocked. Apart from nervous causes, the condition is sometimes observed in chronic dry rhinitis.

² Fränkels *Arch. für Laryng.*, 1903, Bd. xiii. 3, p. 457.

parts of the turbinates, and in the intervals between the attacks the structures appeared normal.

The tumefied tissues feel elastic to the probe, and contract after the application of cocaine.¹ This serves to distinguish the condition from enlargements due to hypertrophic changes, the result of a chronic inflammatory process, in which the swelling conveys a more resistant feeling on palpation, and the application of cocaine does not cause it to shrink. In certain instances both turgescence and hypertrophic swelling are present, and under these circumstances the former will be more or less reduced by cocaine, while the residual hypertrophy will remain unaffected.

Diagnosis.—Vasomotor rhinitis may be confused with hay fever or with acute nasal catarrh. The patient frequently describes the affection as "constant colds in the head;" but the neurosis can readily be distinguished from the catarrhal affection by the sudden onset of the symptoms, the violence of their course, and their abrupt disappearance, and in many instances by the fact that they manifest a diurnal periodicity in their occurrence. Hay fever is distinguished chiefly by its seasonal incidence, beginning usually in the late spring or early summer, and continuing, as a rule, until about the latter part of July. It is to be noted also that a second attack may occur in certain individuals in September. Irritation of the conjunctiva, as also asthmatic symptoms, may be observed in both forms of the neurosis, but the former is rarely so marked in vasomotor rhinitis, and the latter shows a greater tendency to intermit than when associated with hay fever. Vasomotor rhinitis is also said to be unaffected by Dunbar's serum (p. 37), but this remedy also fails to produce any effect in some cases of hay fever; and, on the other hand, Laurens has reported a case, described as "spasmodic coryza," in which the malady was cured by the introduction of pollantin, in powder, into the nose.²

¹ Both Seifert (*Münch. med. Woch.*, 1897, p. 985) and Jankelvitch (*Rev. heb. de Laryngol.*, etc., No. 51, 1897) state that the action of cocaine as a vaso-constrictor is very imperfect in these cases. Seifert suggests that this is due to a temporary paralysis of the vaso-constrictor nerves.

² *Journ. of Laryngol.*, etc., March 1907. It may be mentioned that in the present writer's experience, and also in that of other rhinologists,

The differentiation of paroxysmal rhinorrhœa from the rare disease known as cerebro-spinal rhinorrhœa will be considered in connection with nasal hydrorrhœa (p. 128).

The recognition of the particular cause of the attacks in a given case will usually prove a matter of great difficulty. Morell Mackenzie considered that if attacks of paroxysmal sneezing took place when the patient was exposed to changes of temperature, the cause was often some hypersensitiveness, due, frequently, to general congestion of the mucous membrane; whereas if the sneezing occurred when the patient was in a state of repose, the cause was generally central.

PROGNOSIS

The affection in some instances is obstinately resistive to treatment, but with a judicious combination of local and constitutional measures, even the worst cases may often be cured, or at any rate greatly benefited. As in hay fever, the prognosis, as regards the effects of treatment in a case of long duration, is not necessarily more unfavourable than in one of more recent growth. The present writer has observed numerous instances in which the malady had existed for a number of years before the patient came under treatment, and in which the latter proved entirely successful. Merrick reports a case of paroxysmal sneezing of seventeen years' duration, which was found to be associated with a chronic hypertrophic rhinitis, and was readily cured by treatment directed to the latter condition.¹

The general state of the nervous system should in all cases be investigated, as this constitutes an important element in relation to prognosis. In certain patients a degree of nervous depression is observed to follow an attack; and when the paroxysms are wont to be frequent or prolonged the general health may ultimately suffer. The possibility of certain accidents occurring as the result of paroxysmal sneezing has patients who suffer from hay fever at the usual season give evidence, not seldom, of vasomotor rhinitis at other periods of the year; but a number of observers do not hold this opinion.

¹ *Maryland Med. Journ.*, July 20, 1890.

been referred to at page 109. Lastly, in reference to the spontaneous cessation of the malady, it may be said that there is a tendency generally for the symptoms to become less marked or to disappear as the patient becomes more advanced in years.

TREATMENT

The various therapeutic measures which may be adopted can be broadly divided into those applicable for employment during the attacks, and those devised for the prevention of the attacks, the latter including both general and local measures.

Treatment of the Attacks.—We are faced at the outset by the difficulty that the administration of cocaine, morphia, and similar drugs, although capable of giving speedy relief, is beset with such obvious disadvantages and even dangers that their habitual employment in the case of patients suffering from this neurosis is distinctly inadvisable. It remains, therefore, to consider what other remedies can be employed in place of those referred to. As substitutes for cocaine, similar remedies (*e.g.* euacaine, anæsthesin, adrenalin, etc.) may be administered as are used as local applications for hay fever (see p. 65). In connection with the disagreeable sensation of nasal obstruction, which is often experienced, the writer has obtained good results from the installation in the nasal cavities of a mixture containing adrenalin chloride (1 part), chloretoe (30 parts), neutral liquid paraffin (1000 parts). In cases in which the symptoms are chiefly due to congestion of the mucous membrane, the employment of warm washes or sprays may be found useful, both here and in hay fever.¹

For the relief of the paroxysms of sneezing several simple devices are available, one or other of which frequently proves successful in arresting the attack. One method consists in the inhalation of the vapour of ammonia or that of the liniment of

¹ A suitable formula for a nasal wash of this description is borax and bicarbonate of soda, of each 15 grs.; water, 1 oz. One tablespoonful to be added to two or three tablespoonfuls of warm water. For a nasal spray the same drugs may be prescribed (12 grs. of each to the ounce of water) and the solution diluted with equal parts of warm water when required for use.

iodine, and it can be adopted when the paroxysm is about to commence or when it is actually in progress. If the former agent be selected, a bottle of strong ammonia smelling-salts should be carried by the patient and used as required. The liniment of iodine is sometimes even more efficacious than the ammonia, but if conveyed in the pocket it will obviously be necessary to see that the bottle is securely corked. A few drops of chloroform, the vapour of which is inhaled from the palm of the hand, or pure terebene may be employed for a similar purpose. Another device which may be found successful is light massage of the frontal region; this is effected by drawing the fingers with the palmar surfaces applied to the skin, from the temples to the middle line of the forehead, several times in succession, until the patient is relieved of the inclination to sneeze.¹ Another plan, which sometimes discourages the persistence of the attack, is to avoid using the handkerchief in the ordinary way, the nose being merely wiped but not blown. Morell Mackenzie mentions that men who suffer from paroxysmal sneezing can cure themselves by taking snuff. The substance requires to be used frequently, and its application to be continued for two or three months; but it may prove difficult for the patient to relinquish the habit of snuff-taking when once acquired.

In the rare cases in which the paroxysms are very severe and long continued, and prevent the patient obtaining rest or sleep, it may become necessary to administer morphia for a short period.

Constitutional Treatment.—General therapeutic measures are frequently necessary, but are better employed in connection with local treatment, as it is not common for constitutional treatment alone to result in a cure.

A large number of drugs have been recommended, but of these it will only be possible to consider a selection of the more

¹ De Champeaux, *Rev. heb. de Laryngol., etc.*, February 27, 1909. De Champeaux considers that the relief would possibly be explained by the existence, as Katzenstein asserts, of a centre for sneezing in the frontal lobe.

The familiar method of arresting a sneeze by pinching the nose at the lower border of the nasal bones is explained by the circumstance that the external branch of the nasal nerve becomes superficial at this point.

reputed remedies. In view of the abnormal condition of the nervous system, which frequently underlies the malady, it is usually necessary to prescribe suitable nerve tonics, and these may be combined with medicinal substances possessing the property of diminishing secretion. A useful remedy is a pill containing sulphate of quinine (gr. 1), iodide of arsenic (gr. $\frac{1}{16}$), and extract of belladonna (gr. $\frac{1}{12}$). This may be administered three times a day, the dose of the arsenic and the belladonna being gradually increased. Valerianate of zinc (gr. 1), combined with compound asafœtida pill (grs. 2), is much employed both for this affection and for hay fever. A combination of sulphate of strychnine (gr. $\frac{1}{80}$) and sulphate of atropine (gr. $\frac{1}{150}$) is sometimes of value, especially in cases of marked paroxysmal rhinorrhœa. The drugs may be given in the form of a pill, and the atropine be gradually increased; it will, of course, be necessary to suspend the treatment if any indications of the physiological effects of the atropine begin to be manifested. Morell Mackenzie obtained good results from the administration of small doses of opium, given in the form of the extract or tincture. The administration of bromides, which has been recommended both for hay fever and paroxysmal sneezing, has not, in the author's experience, proved of any definite value.

Among other methods of treatment which have been found useful by various observers are high-frequency currents, electrolysis, galvanism, and, in severe cases, a course of the Weir-Mitchell treatment. Interstitial injections of paraffin in the nasal mucous membrane,¹ the employment of superheated air (Lermoyez), douches of carbonic acid (Cartaz, Servajan and others), vibratory massage of the mucous membrane, and many other methods, have also been recommended.

Avellis, who deprecates local treatment of the nasal cavity, advocates a method which he designates *Wassertreten*, and which consists in treading ankle deep in cold water, the first thing after rising in the morning. Avellis considers that the beneficial effects which have followed the observance of this matutinal rite are referable to its action as a "physical and

¹ Rualt, *Thèse de Bordeaux*, 1906.

psychical counter-irritant."¹ The present writer is much inclined to agree as to the possibility of some effect of the former character being produced, but the exact manner in which the method would act as a "psychical counter-irritant" is not quite clear.

Finally, it should be impressed on the patient that, whatever form of constitutional or local treatment be adopted, the general health should be carefully attended to, the digestion regulated, and that late hours, undue mental or physical exertion, or anything likely to increase the nerve debility which is usually present, should be avoided. A change of air, together with regular and moderate exercise, will also in many instances prove a useful adjunct to the other therapeutic measures which may be adopted.

Surgical Treatment.—In the majority of patients some form of local treatment is requisite, if a cure or any noteworthy improvement is to be obtained. There are, nevertheless, certain exceptional cases in which the attacks of sneezing or rhinorrhœa merely constitute one of the visible manifestations of marked nervous debility or of neurasthenia, and in such instances the general constitutional treatment applicable for these conditions will be of far greater importance than any local measures.

Among the surgical procedures which may be adopted are the correction of intra-nasal abnormalities, the application of the galvano-cautery or chemical caustics, turbinectomy (partial or total), and bilateral excision of the tubercle of the nasal septum.

The question of the **correction of intra-nasal abnormalities** has already been referred to in connection with hay fever, and as similar considerations apply in the case of vasomotor rhinitis the reader is referred to page 75, where the subject is discussed.

The **application of the galvano-cautery and chemical caustics** is also described in the previous section (p. 76); and with regard to the frequency with which these agents should

¹ Avellis, "Die Behandl. des nervös. Schnupfens," *Therap. Woch.*, 1897.

be used, it will be evident that the number of separate applications would be regulated by the amount and the duration of the improvement which is observed.

Partial or Total Turbinectomy—Scarification of the Inferior Turbinate.—Partial turbinectomy has been recommended by Berbineau,¹ and total turbinectomy has been practised by Lack² and others for cases of exceptional severity. Lack reports that he has removed the middle and inferior turbinates, on both sides, in four instances of this character in which other methods of treatment had proved ineffective, with marked benefit to the patients and without any after-effects of an unfavourable character. My personal experience has been limited to two cases, both of which were very marked instances of the disorder. The inferior turbinate was removed, on each side, with considerable benefit in both cases, but without entirely removing the tendency to rhinorrhœa.

Scarification of the inferior turbinate has been recommended by Sheedy for cases in which the condition is chiefly one of vasomotor turgescence.³ From ten to twenty incisions are made in the affected structures, and Sheedy reports that good results have been observed in over a hundred cases.

Bilateral Excision of the Tubercl^e of the Nasal Septum.—This operation has, up to the present, produced more satisfactory results than any other procedure of which the author has had experience.⁴ The method is based on the hypothesis—for which there is some support both on experimental⁵ and clinical grounds—that the nasal mucous membrane, although capable of responding to sensory impressions in any part of its extent, possesses certain special areas which are physiologically more active than others, this activity being concerned with the setting in action of the reflex mechanism of the nose;

¹ "Traitement du coryza spasmodique par la turbinotomie partielle," *Soc. fran^çaise de Laryng.*, 1898.

² "Diseases of the Nose," London, 1906, p. 253.

³ *The Post Graduate*, August 1909.

⁴ The author is indebted to Mr. Richard Lake of London for the suggestion of removing the tubercle of the nasal septum in paroxysmal sneezing and hay fever.

⁵ See Sandmann, "Athemrefl. von der Nasenschleimh.," *Du Bois-Reymonds Arch. für Phys.*, 1887, p. 483 *et seq.*

and, further, that these areas may develop a morbid excitability in connection with various functional disorders, with local disturbances, or with other abnormal conditions. Of the regions in question, that corresponding to the tubercle of the septum appears in many instances to be the principal offender; but the anterior extremities of the inferior and middle turbinates, and in some cases other areas, may likewise become involved. The operation consists therefore in the removal of the first-named structure, combined, in some cases, with the surgical treatment of the hyperaesthetic areas on the middle and inferior turbinates.

In performing the operation a general anaesthetic is required, the patient being arranged in a semi-recumbent position.¹ The surgeon should be provided with an electric head-lamp, a nasal speculum, a sharp spokeshave, Grünwald's or Hartmann's punch-forceps, a pair of nasal scissors, and a nasal snare threaded with fairly stout wire. I have found it convenient to pack the lower anterior regions of the nasal cavity with a solution of adrenalin (1 in 1000) for about twenty minutes before the operation, as a clearer field for observation is thus obtained. The tubercle is a spindle-shaped structure, situated opposite the anterior end of the middle turbinate, and can be readily removed with a single sweep of the spokeshave (see Plate II.). The anterior end of the inferior turbinate, if showing any hypertrophic changes, is then removed with the scissors and snare; or in the absence of such changes the mucous membrane may be cauterised at a subsequent date.² The final step consists in the rectification of any marked intra-nasal abnormalities, if these have not already been dealt with. In my experience, however, in some of the worst cases there has been nothing of this character to be observed.

The results of this operation have been, in the aggregate,

¹ The operation can be done with the patient lying flat, but the writer has found the semi-recumbent position more convenient. It is desirable, in the latter case, to arrange the patient in such a manner that the head can be immediately lowered if necessary.

² In the writer's more recent cases he has generally removed the mucous membrane of the anterior end of the middle turbinate, in addition to the other procedures mentioned.

of a very satisfactory nature. It has been practised, almost entirely, in severe cases, representing various types of the neurosis; that is to say, some patients have suffered more especially from violent attacks of sneezing, others from profuse rhinorrhœa, and others again from asthma, in addition to one or both of the preceding manifestations. It is not possible, however, at the present moment, to form any final conclusions as to the actual scope or utility of the operation, owing to the somewhat recent adoption of the method and the relatively small amount of clinical material. Nevertheless, it can be said that in the great majority of the cases a striking amount of relief has been afforded, and in a number of instances the symptoms have entirely disappeared, the longest period of complete immunity, so far, being one year and four months. In two instances the operation proved a complete failure. Several cases have unfortunately been lost sight of, and the following notes refer to some of those who have remained under observation to the present date.

F. B., male. A case of paroxysmal sneezing and rhinorrhœa which began two years before coming under observation. The rhinorrhœa came on every day and persisted without intermission for about four hours. The attacks presented a curious regularity in their mode of occurrence, and were usually manifested as follows:—The running from the nose almost invariably commenced as soon as the patient got up in the morning (7 A.M.), but became more marked when he commenced his work, which involved leaning forward over a bench. A prolonged attack of sneezing would then come on, and the patient generally retired from his bench, while this was in progress, in order to escape the banter of his fellow-workers. On resuming work he stuffed a handkerchief or cloth in the bosom of his apron, as he was obliged to keep constantly wiping his nose, otherwise the secretion simply "dripped" from it. The rhinorrhœa usually ceased about 11 A.M. and did not recur until the following morning. Excision of the septal tubercle was done on January 14, 1909. **Result.**—At the present date (1½ years after operation) the patient reports that there has been no further rhinorrhœa while at his work, and there have

been no more attacks of paroxysmal sneezing. He occasionally has a little running from the nose the first thing in the morning.

A. W., female, aged 25. This was a case of vasomotor rhinitis which had lasted for three years. The patient had had various forms of nasal and constitutional treatment without any relief to the symptoms. The attacks came on three or four times a week, and were of a severe character. The rhinorrhœa persisted for six or eight hours, and was accompanied by violent paroxysms of sneezing; the patient sometimes sneezed twenty or thirty times in succession, and would become completely exhausted. The nose was always more or less blocked, but this symptom was especially troublesome at night, so that the patient was "afraid to put her head back on the pillow," as the nasal cavities then became almost completely obstructed. Operation performed on March 31, 1909. **Result.**—There has been complete freedom from the nasal obstruction and the paroxysms of sneezing, but the patient has had a few attacks of rhinorrhœa (each lasting several hours) to the present date (about one year and three months after operation).

A. K., female, aged 33. The patient suffered from more or less constant blocking of the nose, with rhinorrhœa, which first commenced about nine months before coming under observation. The blocking occasionally remitted for a day or two, but these remissions were rare. The rhinorrhœa, although it frequently occurred in the daytime, was especially troublesome at night; the patient often used six handkerchiefs during this period, and the pillow-slip was said to be always "wet through."¹ On examining the nasal cavities the turbinates were found to be swollen and turgescent, and in contact with the septum, leading to almost complete obstruction. Operation performed on March 8, 1909. **Result.**—There has been complete immunity from the rhinorrhœa and nasal obstruction to the present date (one year and four months after operation).

S. G., male, aged 25. The patient had suffered from paroxysmal rhinorrhœa, with sneezing and nasal obstruction, for four or five years. The attacks occurred several times a

¹ The night sister at the Throat Hospital corroborated this last statement, as regards the night the patient was in hospital before the operation.

week, and the rhinorrhœa lasted on an average for $1\frac{1}{2}$ hours, but sometimes continued all day. He had had intra-nasal treatment with the galvano-cautery with temporary relief. Operation performed on January 5, 1909. **Result.**—About fourteen days after leaving the hospital some sneezing and rhinorrhœa were observed. These symptoms, as also the nasal obstruction, afterwards increased and finally became as bad as ever. After the trial of numerous remedies the patient was ultimately relieved by Lermoyez's atropine-strichnine method (see p. 129).

E. T., male. A severe case of paroxysmal sneezing and rhinorrhœa, with asthma, of several years' duration. The running from the nose occurred several times a week, and often persisted for practically the whole day. The patient had an asthmatic attack each morning, beginning about 4 or 5 A.M., and lasting for an hour. These attacks had been getting worse during the last two years before the patient came under observation. The septal tubercle, on both sides, was removed on June 3, 1909. **Result.**—The asthma was only slightly improved, but the rhinorrhœa was considerably lessened and the paroxysms of sneezing were almost completely abolished. As the patient was particularly desirous of obtaining more relief, especially to the asthma, if it were possible, I removed the anterior ends of the middle turbinates, and also the mucous membrane covering the anterior extremities of the inferior turbinates, on August 28, 1909. The final result was great relief to the asthma, and complete cessation of the paroxysms of sneezing. The patient states that occasionally he has a slight attack of rhinorrhœa.¹

A. S., female, aged 34. A case of paroxysmal sneezing and rhinorrhœa, combined with asthma. The asthmatic attacks were of daily occurrence, taking place regularly at two o'clock each morning; but sometimes a severe attack, lasting twenty-four hours, would occur. The paroxysms of sneezing and rhinorrhœa made their appearance, on an average, three or

¹ As in this case the anterior extremities of the middle turbinates were in a polypoid condition and were in contact with the septum, it is very possible that the ultimate result is to be mainly attributed to the rectification of this lesion.

four times a week. They varied in severity, but in most instances each attack lasted several hours (*e.g.* a whole afternoon), and as many as fourteen handkerchiefs were sometimes soaked through in this period. The rhinorrhœa was accompanied, at intervals, by paroxysms of sneezing, often consisting of fifteen or twenty individual sneezes in succession, and leading sometimes to considerable exhaustion. On rhinoscopic examination nothing abnormal was to be detected in the nasal cavity except a slightly swollen appearance of the middle turbinates. The operation, which included the excision of the septal tubercle, together with the mucous membrane covering the anterior ends of the middle and inferior turbinates, was performed on October 9, 1909. **Result.**—No sign of asthma, paroxysmal sneezing, or rhinorrhœa to the present date (nine months).

Miss E. M., a patient of Dr. Stenhouse of Manchester, suffered from paroxysmal sneezing, rhinorrhœa, and asthma; also from hay fever and hay asthma, beginning usually in the late spring. These conditions were of about five years' duration. The asthmatic attacks took place about every fortnight, and the paroxysmal sneezing and rhinorrhœa occurred several times a week. The operation, which comprised the removal of the tubercle of the septum and of the mucous membrane covering the anterior ends of the middle turbinates, was performed on November 9, 1909. The galvano-cautery was subsequently applied to the anterior extremities of the inferior turbinates. **Result.**—No symptoms of asthma or of paroxysmal sneezing or rhinorrhœa to the present date (eight months after operation). There has been no hay fever or hay asthma up to the present, although the period is long past at which these conditions usually develop.¹

¹ It may be mentioned, in connection with the subject of paroxysmal sneezing and rhinorrhœa, that motorists sometimes suffer from unpleasant nasal symptoms—due apparently to road dust—which usually take the form of hypersecretion, but occasionally that of sneezing.

IDIOPATHIC RHINORRHœA

Nasal Hydrorrhœa.—By the term idiopathic rhinorrhœa, or nasal hydrorrhœa, is implied a somewhat uncommon neurosis in which the discharge of a clear watery fluid, of nasal origin, and emanating, in the great majority of cases, from both nostrils, is, to all intents and purposes, the only manifestation. Although the nasal source of the secretion is necessarily understood in connection with this disorder, it is probable that a number of cases, which have been published under the designation of "nasal hydrorrhœa," have not in reality been instances of nasal hypersecretion at all, but examples of the spontaneous escape of cerebro-spinal fluid from the nose (p. 128). It may be said, however, that, owing chiefly to the work of St. Clair Thomson,¹ the two morbid conditions are now clearly distinguished.

The exact **etiology and pathology** of idiopathic rhinorrhœa is obscure, although there is little doubt that it is allied to the neuroses which have been already discussed; and the disorder is considered by some observers to be merely a distorted or atypical manifestation of the affections in question. A number of patients are of the nervous temperament, or suffer from neurotic or neurasthenic conditions. Gout and allied affections have been thought to constitute, in some instances, a predisposing cause, and the disorder has also been considered to occur as the result of malaria (Chappell,² Penkövy,³ Jankelvitch⁴). The malady is one of adult life, and the sexes are affected in about equal proportions. As in the case of hay fever and of vasomotor rhinitis, nasal polypi, hypertrophies of the mucous membrane, or other intra-nasal lesions may in some instances be present, whereas in other instances no abnormalities of this character are to be detected.

The exciting causes, which are often of a trivial character, are similar to those which are observed in connection with

¹ "The Cerebro-Spinal Fluid: its Spontaneous Escape from the Nose," London, 1899.

² *New York Med. Journ.*, September 29, 1894.

³ *Internat. klin. Rundschau*, November 4, 1889.

⁴ *Rev. heb. de Laryngol., etc.*, No. 51, 1897.

vasomotor rhinitis. Thus the attack may be precipitated by sudden changes of temperature, or by the action of dust, smoke, or other irritants. Traumatism has been regarded as the cause in cases reported by Freudenthal,¹ Flatau,² and others.

Among other assigned causes may be mentioned paralysis of the fifth nerve, as in a case reported by Althaus.³ This observer considered that the hypersecretion, in his case, was due to the abolition of the inhibitory function of the fifth nerve, the sympathetic having then usurped complete control. Bosworth⁴ holds the view that this loss of inhibitory function in the fifth nerve is, in a number of instances, the chief factor in the production of the neurosis, but that, when the nerve is intact, the manifestations are to be referred to some disturbance or irritation involving the sympathetic system. A similar view has been expressed by Hardie.⁵ In one of Bosworth's reported cases the nasal affection had been preceded by facial neuralgia, which, however, ceased as soon as the rhinorrhœa became established.

Morbid conditions of the accessory sinuses have been regarded by some observers as constituting the actual cause of the rhinorrhœa, the secretion being considered to be derived from the affected cavity. Anderson has reported a case in which polypi in the left maxillary antrum were associated with a watery discharge from the left nostril. The opening and draining of the sinus produced no effect, but after a thorough clearance of the polypi the rhinorrhœa entirely ceased.⁶ Anderson considered that the excessive secretion was

¹ *Laryngoscope*, August 1899. In Freudenthal's case an attack of unmistakable rhinorrhœa occurred during the night, following the performance of Asch's operation on the septum.

² *Berlin. Laryng. Gesellsch.*, April 17, 1896; *Internat. Cent. für Laryngol., etc.*, 1896. In this instance, one of six years' duration, the attacks began to appear immediately after the application of the galvano-cautery to the nose.

³ *Brit. Med. Journ.*, 1868, vol. ii. p. 647; *ibid.*, 1878, vol. ii. p. 831. In this case the secretions were markedly increased, not only in the nose, but also in the eye and in the mouth. The lips appeared covered with froth and had to be constantly wiped.

⁴ "Diseases of the Nose and Throat," London, 1897, p. 148.

⁵ Hardie and Wood, *New York Med. Journ.*, September 6, 1890.

⁶ *Brit. Med. Journ.*, February 6, 1892, p. 276.

derived from the mucous membrane of the antrum, but, in the present writer's opinion, a more feasible explanation is to be found in the suggestion that the condition was merely a reflex nasal manifestation set up by the presence of the polypi in the sinus, in the same manner as numerous other reflex disturbances may be produced in the nose by extra-nasal causes. Lichtwitz has reported an instance of a somewhat similar character, except that the disorder was referred to a chronic catarrh of the frontal sinus, and that there were numerous other phenomena (sneezing, photophobia, lachrymation, hemi-crana, etc.), in addition to the hypersecretion.¹ Fink regards the antrum as the usual source of the secretion, and records that he has been able to detect the fluid in the act of issuing from the middle meatus.²

With regard to the question of whether the mucous membrane of the accessory sinuses is capable of secreting fluid to a sufficient extent, and in such a manner, as to cause attacks similar to those described, it may be said that, in view of the histological characters of the mucosa lining these cavities (which differs from the nasal mucosa in the paucity of glandular tissue and of vessels, and in the thinner and more periosteal character of the structure), it is extremely doubtful if the sinuses are ever responsible for the condition under discussion.³

The character of the fluid resembles that of ordinary nasal secretion, and Professor Haliburton's analysis shows the following composition:⁴

Water	98.792	per 100
Total solids	1.208	

¹ *Arch. clin. de Bordeaux*, December 1892.

² "Ueber Hydrorrhœa nasalis," *Wiener med. Presse*, October 20, 1895. See also *ante*, pp. 28, 81.

³ It is true that certain of the accessory sinuses may become distended with fluid, secreted from the mucous lining, owing to an impermeable obstruction of the outlet (*mucocele* or *cystic distension*). But the condition, in such cases, represents merely an accumulation of normally secreted fluid, and does not imply that the mucosa of the sinus is capable of periodical outbursts of hypersecretion similar to those manifested by the nasal mucous membrane.

⁴ Quoted, St. Clair Thomson, *loc. cit.*, p. 85.

Proteids (including mucin)	0·260
Other organic substances	0·163
Inorganic substances	0·785

According to Haliburton's report the fluid was thick and viscid, and slightly opalescent, and on microscopic examination it showed the usual appearance presented by mucus, namely, amorphous matter with mucous corpuscles. It was also found that the fluid did not reduce Fehling's solution, in which respect it differed from cerebro-spinal fluid (see below).¹

With reference to the source of the secretion, Brindel considers that the fluid does not emanate from the mucous glands of the nose, but that it is referable to a serous transudation into the tissues, and thence to the surface of the mucous membrane, the process representing a species of dropsy with immediate escape of the extravasated fluid.² He advances, by way of proof, the observation that very few glands were to be found in a number of specimens which he examined, and that atrophy of these structures was also observed. It is difficult, nevertheless, to account for the presence of mucin and other constituents of nasal secretion unless the glands are to be regarded as participating in the process.

SYMPTOMS

Although the flow of secretion from the nose is the special, and practically the only, symptom, the manifesta-

¹ A comparison of Professor Haliburton's analysis with that of von Berzelius, for normal nasal secretion, and of Wright, for catarrhal secretion, would seem to indicate that the fluid in cases of rhinorrhœa resembles the latter rather more closely than the former.

Normal secretion—	Water	93·4
	Solids	5·3
Catarrhal secretion—	Water	95·6
	Mucin	3·2
	Albumen	0·4
	Salts	0·5

Aschenbrandt found only a very minute quantity of mucin in catarrhal secretion. He notes the specific gravity as 1001-1002 (see Aschenbrandt, "Die Bedeutung der Nase für die Athmung," Würzburg, 1886).

² *Journ. de Méd. de Bordeaux*, December 18, 1898.

tion may be preceded by some indications of nasal irritation. Thus, there may be a feeling of formication about the bridge of the nose, or a sensation of tickling within the nasal cavity. The rhinorrhœa is either sudden in its onset, or develops gradually; in the former case one or more sneezes occasionally usher in the attack, with perhaps slight nasal obstruction.

As a rule the secretion flows from both nostrils, but, exceptionally, only one nasal cavity is affected.¹ In rare instances the fluid may cease to be discharged from one nostril, and may commence to flow from the other.² The amount lost during the course of an attack is variable, but may reach a prodigious quantity. In a patient of Bosworth's the amount was about 1 oz. in an hour, and Fink reports an instance in which 40 c.c. were regularly discharged in the same period.³ Rees mentions the case of a woman, aged 52, who was accustomed to lose a quart of clear fluid from the left nostril in the course of twenty-four hours.⁴ Körner records as much as 3 litres being lost in the twenty-four hours.⁵ The flow may last for a few minutes or hours, or may persist for days. The secretion is sometimes swallowed instead of being discharged externally, or it may pass into the pharynx and set up cough.

No distinctive or characteristic appearances are to be observed on rhinoscopic examination, except that when the paroxysm is in progress some slight swelling of the mucous membrane may be perceived. In a few instances, as already stated, such intra-nasal lesions as mucous polypi may be found, and these growths have been observed to develop during the course of the affection (see p. 104).

¹ See a case reported by Urban Melzi, *Journ. of Laryngol., etc.*, December 1899.

² Navratil (*Internat. Central. für Laryngol., etc.*, No. 11, 1908) has recorded an instance of this character.

³ *Loc. cit.*

⁴ *London Med. and Surg. Journ.*, 1834, vol. iv. p. 823. The nasal condition, in this case, was associated with general anasarca.

⁵ Heymanns "Handbuch der Laryngol., etc.", 1900, Bd. iii. H. 1, p. 647. 3 litres would represent more than $2\frac{1}{2}$ quarts.

DIAGNOSIS

The differentiation of idiopathic rhinorrhœa from hay fever would seldom prove a matter of difficulty; the absence of the sneezing, nasal obstruction, and ocular symptoms which characterise the latter, together with the season of its occurrence, being sufficient to distinguish it. A first attack of idiopathic rhinorrhœa might be mistaken for one of acute nasal catarrh, but the subsequent course of the affection would reveal its true character.

Inasmuch as the term nasal hydrorrhœa implies the discharge of secretion from the nasal cavity itself, it is necessary to differentiate other conditions in which the fluid, although discharged through the nose, does not emanate from the mucous membrane lining that cavity. In the latter category is to be included the very rare affection which is characterised by the escape of cerebro-spinal fluid through the nose (**cerebro-spinal rhinorrhœa**). In most cases of the latter disease the fluid leaves the cranial cavity in the region, probably, of the cribriform plate or of the sphenoid bone, and the chief points of distinction from nasal hydrorrhœa are to be found in the history of the case and the character of the fluid discharged from the nose. The escape of the fluid is more or less continuous; in the majority of cases it is from one nostril only, and there are no accompanying nasal symptoms.¹ Headaches, relieved to a greater or less extent according to the freedom with which the discharge escapes, are usually complained of, and there may be such cerebral symptoms as vertigo, vomiting, convulsive attacks, optic neuritis, etc. The character of the fluid in idiopathic rhinorrhœa has already been referred to. The presence of mucin, the circumstance that it does not reduce Fehling's solution, and the percentage of proteids and solids, are sufficient to distinguish this secretion from normal cerebro-spinal fluid. It may be added that in the former case the handkerchief usually dries stiff, whereas, in the latter case, it remains quite pliable.

¹ Cerebro-spinal rhinorrhœa may, however, be accompanied by a slight amount of sneezing, and polypi have also been observed to develop in the course of the affection. See a case reported by Priestley Smith (*Ophthal. Review*, 1883, ii. p. 4). Dr. St. Clair Thomson has also informed me of a similar case which occurred in his own experience.

A curious case has been recorded by De Laval in which the secretion from the parotid gland was discharged through the nose, owing to a fistula of Stenson's duct, which led into the antrum, and so permitted the escape of the fluid into the nose.¹ The fistula had occurred as the result of a radical operation on the maxillary sinus.

A rare affection, designated by Mulhall *rhinitis œdematosa*, appears to possess a certain affinity with nasal hydrorrhœa.² The condition consists of a serous infiltration of the turbinal mucous membrane, referable in most instances to an angioneurotic process. The œdema has been observed to show a migratory disposition in some cases.

PROGNOSIS

Although the affection is not a serious one it is often very resistive in regard to treatment, and it usually proves a source of great annoyance, and may, in certain cases, interfere with the patient's occupation. The ultimate prognosis is not unfavourable, as in the course of a longer or shorter period the rhinorrhœa ceases.

TREATMENT

For the actual attack, similar medicinal remedies to those used in paroxysmal sneezing may be tried. To prevent the recurrence of the paroxysms, Lermoyez recommends a mixture of atropine and strychnine, the former for its action on the secretory nerve fibres, the latter for its effect on the vasoconstrictor nerve centres.³ The administration of belladonna

¹ *Rev. heb. de Laryngol., etc.*, June 29, 1901.

² Mulhall, "Rhinitis œdematosa," Amer. Med. Assoc., May 1893. (Quoted, *Internat. Cent. für Laryngol., etc.*, vol. ii. p. 257.)

³ Lermoyez's method of administering these drugs is to prescribe sulphate of atropine, 3 centigrammes, sulphate of strychnine, 5 centigrammes, syrup of orange, 400 grammes. Of this, one "cuillerée à soupe" (tablespoonful) is to be taken at breakfast for ten days, then, for another ten days, a dose both at the morning and the evening meal. In severe cases Lermoyez occasionally prescribes the remedies for a further period of ten days, but, as a rule, he allows a fortnight to elapse after the twenty days' course and

has also been recommended for its properties in inhibiting secretion.

As local treatment, the galvano-cautery has been recommended, but its use is deprecated by a number of observers as being liable in some instances to aggravate the symptoms. The particular necessity of refraining from any surgical measures if the case is known or suspected to be one of cerebro-spinal rhinorrhœa will be evident, on account of the risk of intra-cranial infection. The removal of any gross intra-nasal lesions, in cases of nasal hydrorrhœa, would be advisable if causing nasal obstruction or other symptoms. Treatment by superheated air, as employed in hay fever (p. 73), has proved useful in properly selected cases (Lermoyez, Grélety-Bosriel, and others). The employment of astringents, *e.g.* weak solutions of nitrate of silver (Rhodes), has also given good results. Cresswell Baber has observed good effects from the application of galvanism externally to the nose,¹ and Lichtwitz has seen beneficial results from the application of orthoform to the nasal mucous membrane. General constitutional treatment, together with change of air and a visit to a suitable health resort, will in many cases lead to better results than can be obtained by local measures. With regard to the author's method of treatment for vasomotor rhinitis, it may be remarked, that although this procedure has not been employed in any cases of pure idiopathic rhinorrhœa, the operation has generally resulted in the abolition of the symptom when it has been combined with other nasal manifestations.

then repeats the treatment if necessary. The drugs administered according to Lermoyez's prescription would be given in the approximate dose of $\frac{1}{250}$ gr. of sulphate of atropine and $\frac{1}{45}$ gr. of sulphate of strychnine.

¹ *Journ. of Laryngol., etc.*, April 1902.

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